The Builder.

VOL. LXIV. NO. 2619. APRIL 15, 1893.

ILLUSTRATIONS.

The Northampton Institute, Clerkenwell: Selected Design.—Mr. E. W. Mountford, F.R.I.B.A., Architect.....*Double-Page Photo-Litho.*
New Imperial Law Courts, Tokio, Japan: Design as at First Proposed by Messrs. Ende & Boeckmann.....*Double-Page Ink-Photo.*
Imperial Law Courts, Tokio: Design Finally Accepted: Messrs. Ende & Boeckmann, Architects .....*Double-Page Ink-Photo.*
Parish Room and School, All Saints', Plymouth.—Mr. Edmund Sedding, Architect .....*Single-Page Ink-Photo.*
St. Marylebone General Dispensary.—Mr. Beresford Pite, Architect .....*Single-Page Ink-Photo.*

Blocks in Text.

Details of Japanese Architecture..... PAGES 280, 281
Plan of the Northampton Institute, Clerkenwell ..... „ 288
Plan of the St. Marylebone General Dispensary ..... PAGE 289
Diagram Illustrating Article on Chemistry ("Student's Column") ..... „ 293

CONTENTS.

The Local Government Bill 279
Some Notes on Japanese Architecture..... 281
Notes 282
The Pier Foundations of the Tower Bridge 284
The Mausoleum and its Sculptures..... 284
Competitions 287
Architectural Societies..... 287
Northampton Institute, Clerkenwell 288
The Imperial Law Courts, Tokio 288
Parish Room and School, All Saints', Plymouth 288
St. Marylebone General Dispensary 289
The Royal Commission on Metropolitan Water Supply 289
The London County Council..... 291
Lectures, &c.: The Architectural Association..... 292
Terra-Cotta and Stone..... 292
The Students' Column: Chemistry.—XV. 292
General Building News 293
Sanitary and Engineering News 293
Foreign and Colonial..... 294
Miscellaneous 294
Meetings 295
Recent Patents 295
Some Recent Sales of Property 296
Prices Current..... 297

The Local Government Bill.

THE importance of the Local Government Bill to the inhabitants of rural England can scarcely be overrated: it may affect the health and the well-being of many thousands of persons in this country probably more than any other measure of recent times. It is sometimes regarded as the complement of the Local Government Act of 1888, by which County Councils were established. But whilst that measure introduced a new administrative body, the Bill really restores in a sense the original administrative unit outside cities and boroughs. The vestry—in other words the inhabitants of the parish gathered in an assembly which selected certain of its members to perform various functions—was the administrative unit. This Bill proposes to establish Parish Councils elected by the inhabitants of the parish, and they will perform the function to a large extent of parish officers. Hence this measure is at once conservative and reforming, for it revives, in a new form, the administrative action of the parish which, through Acts of Parliament and local inaction, has gradually lost its former vitality. Nor can there be much doubt that, for many reasons, the measure which has been introduced this session should have preceded the Act by which County Councils were constituted, since, in the first place, it was desirable to establish in full working order the administrative unit. But the present Bill might, with advantage, have been divided into two measures, since it establishes not only Parish Councils, but District Councils, which latter are not confined to rural places.

Assuming for a moment, however, that this Bill becomes law, there will then exist, in every parish in England which contains over three hundred inhabitants, an assembly elected by the people of the place whose business it will be to manage the local affairs of the parish. When a parish contains less than the above number of inhabitants, it will be grouped with another or other parishes. Whether such grouping is desirable is a matter of doubt: a Parish Council elected by less than three hundred persons would be a modest kind of body; but, after all, it would be animated by more local spirit than a body representing a group of parishes—in other words, a district with different aims and objects. That small parishes might with advantage combine for certain purposes is, no doubt, true; but it would be better to give parishes the power to do this rather than oblige small parishes to lose their particular existence. For example, among the duties of the Parish Council will be (sec. 6, sub-sec. iii.) "the holding of parish property or village greens or allotments for recreation grounds, or for gardens, or otherwise for the benefit of the poor." It is easy to imagine unbounded rivalry and animosity in reference to the proper maintenance of two village greens. On the other hand, if of two small adjacent villages one only has a green, there might well be a combination to maintain the one as a recreation ground for two villages.

Speaking broadly, the Parish Council will have authority to manage all the secular business of the parish: its powers will be practically unlimited. Certain statutory powers are transferred to it, which it can adopt if it sees fit, such as those under the Lighting and Watching Act, 1833, the Baths and Wash-houses Acts, 1846 to 1882, the Burials Acts, 1852 to 1885, the Public Improvement Act, 1860, and the Public Libraries Act, 1892. But wider additional powers are conferred by the eighth section—namely, power "to provide or acquire buildings for public offices for meetings and other public purposes." The last words are so comprehensive that they appear to include almost any kind of building, such as village halls, cottage hospitals, and almshouses. Further, the Parish Council may acquire land for the above purposes, for recreation grounds and for public walks. They may "utilise any supply of water within their parish." Practically, therefore, a Parish Council may obtain a proper water supply for a village, a power which, if carefully and sagaciously used, would be of unbounded benefit to the community. But having regard to the apathy in reference to sanitary matters which prevails in pretty nearly every village, from Northumberland to Sussex, it is to be feared that however valuable this power may appear on paper, it will not have much real effect except under the gentle pressure of the Local Government Board. But a possibility of local activity is given by this Bill: a village, whether it possesses a Hampden to take the lead or not, will, when this measure becomes law, be able to improve the minds and the bodies of its inhabitants. It may have its public library, its village hall, its recreation ground, its wholesome water. It will not be dependent on private benevolence or individual kindness; the collective action of the community, if it is willing to bear the necessary pecuniary burdens, may turn a deserted village into an Arcadia.

So much for the Parish Council—a body elected by ballot by the people of the parish. The District Council is a different body; it is not a purely rural assembly, "Urban Sanitary Authorities shall be called Urban District Councils," and "for every rural sanitary district there shall be a District Council." To each Rural District Council shall be transferred "all the powers, duties, and liabilities of the Rural Sanitary Authority in the district, and of any highway authority in the district." In addition to these clearly-defined powers, District Councils have conferred on them certain rights in regard to public rights of way, of a somewhat hazy character. The weak part of the Bill appears to be the creation both of Village and District Councils. Such dual existence will weaken both bodies. Nor does the duplication of authorities seem necessary. The parish has now, where highway boards do not exist, the management of the highways other than main roads, which latter are under the control of the County Councils. There is no adequate reason why the Parish Councils should not possess the same power as the present vestries. The tendency of the County Councils is to gain the control of a larger area of highways by declaring what may be called parochial roads to be main roads, hence parishes and highway boards are gradually having fewer roads to manage. The Parish Councils will be more capable than the existing vestries of looking after highways, and they certainly ought to retain the control of them. Rural and Urban Sanitary Authorities might then remain in their present state and retain their present name.

A larger area than the parish may well be necessary at present for the administration of the Public Health Acts, though there can be no doubt that if the Parish Council is fit to be trusted with the water supply—or, indeed, is worth calling into existence—it will eventually have to become in rural districts the Sanitary Authority.

Oddly enough, too, under this Bill, the

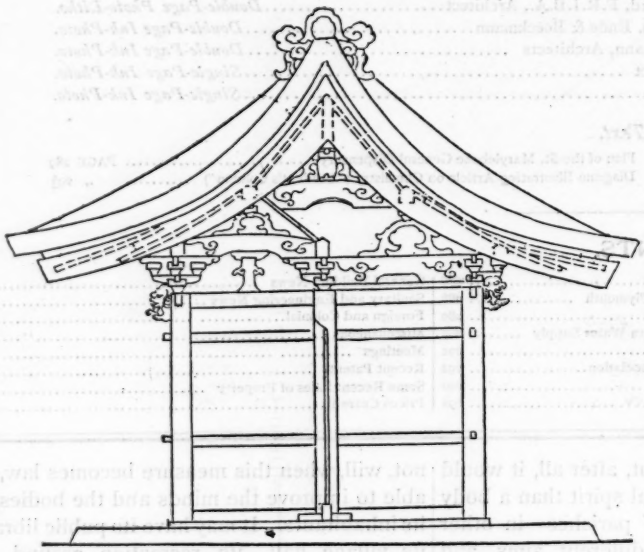


Fig. 8, Side View of Entrance to Shinto Temple.

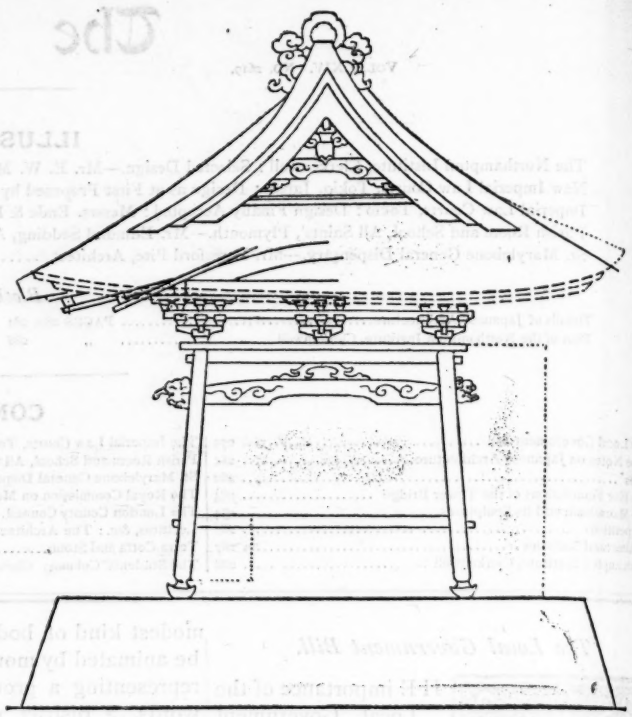


Fig. 9. Shinto Bell-tower.

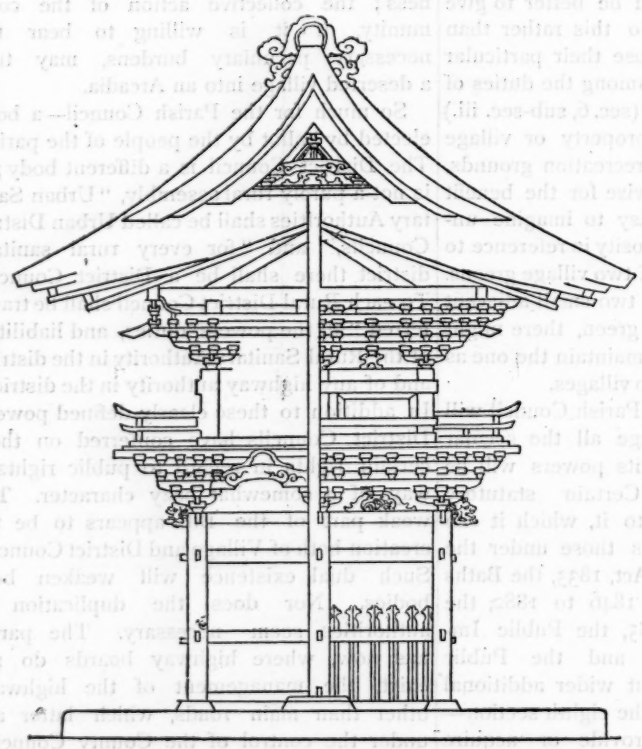


Fig. 10, Tower Gateway to Buddhist Temple.

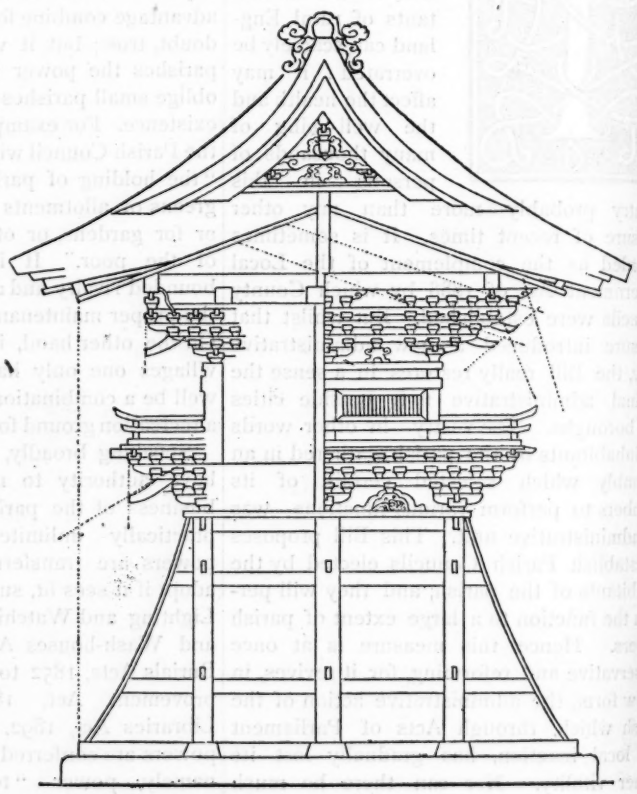
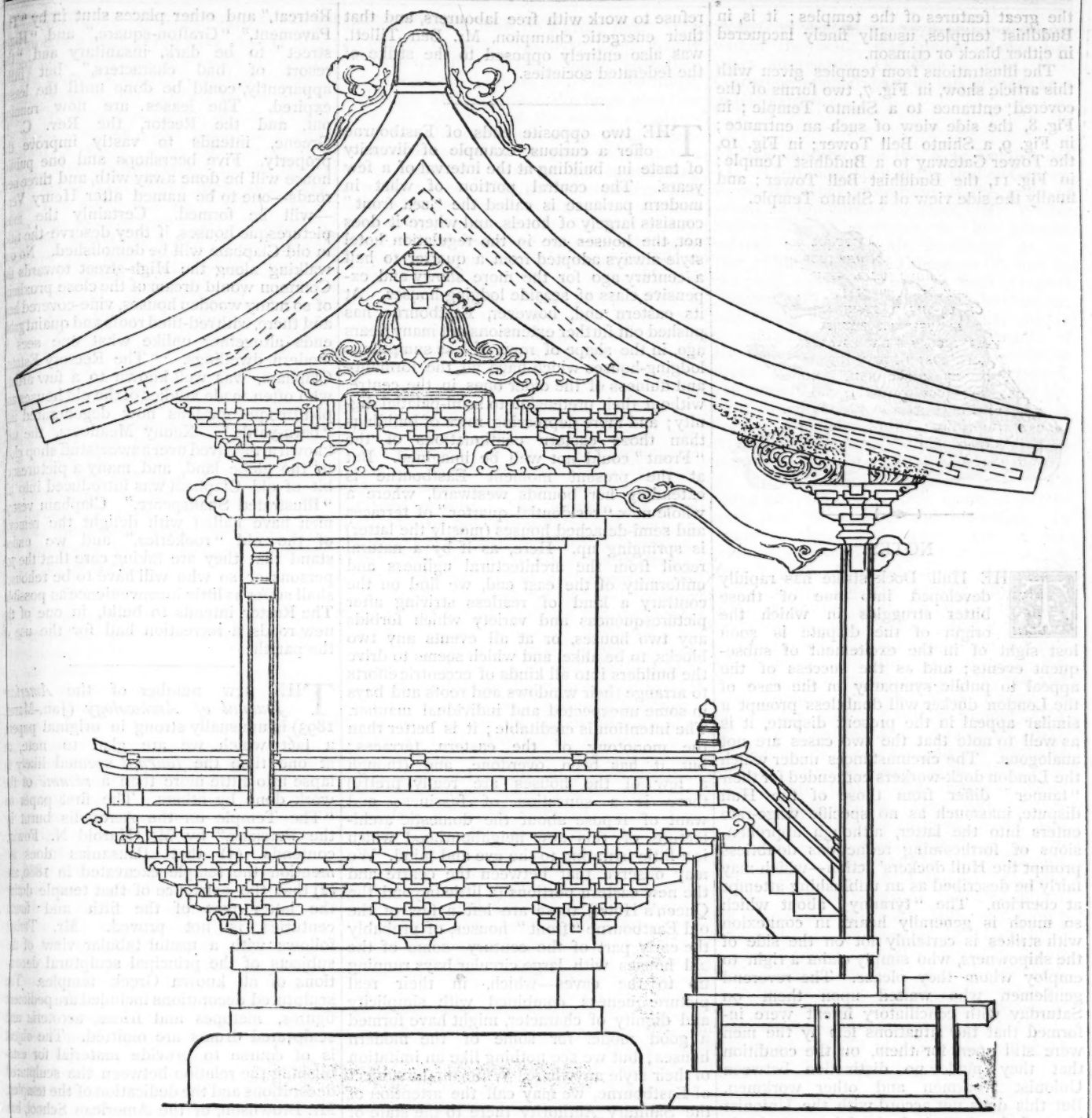


Fig. 11, Bell-tower to Buddhist Temple.

Parish Council may, in regard to sanitary matters, act as a kind of censor of the District Council, for it is enacted by the fifteenth section that "where a Parish Council consider that a District Council ought to have provided the parish with sufficient sewers, or to have maintained existing sewers, or to have provided the parish with a supply of water in accordance with the Public Health Acts, or to have enforced with regard to the parish any provision of the Public Health Acts, and have failed so to do, the Parish Council may complain to the County Council, and the County Council, if satisfied, after due inquiry, that the District Council have so failed as respects the subject matter of the complaint, may resolve that the duties and powers of the District Council for the purpose of the matter shall be transferred to the County Council, and they shall be transferred accordingly." It seems clear, therefore, that the Government do not place any great reliance on the sanitary activity of the District Councils; on the other hand, it is rather a large assumption to suppose that a Parish Council will show more intelligence in such matters than a District Council. But if there is this distrust of the District Councils in regard to sanitary matters, there can be no strong reason for calling them into existence to take the place of the Rural Sanitary Authorities, which might, as we have said, well remain the bodies responsible at present for the administration of the Public Health Act, just as in certain parishes the School Board, where there are no voluntary schools, only exist to manage the elementary education of the parish, though it is possible that, in the future, the Parish Council may absorb the School Board.

To the District Council are also transferred various powers not known to the public generally—such as appeals from police as to certificates for pedlars, and the licensing of dealers in game. Some of these functions might well be handed over to the County Councils, and others to the Parish Councils, which should be the administrative units of the county of which the County Council is the general assembly.

It will be obvious from this short sketch of the main and cardinal principles of this measure that we used no exaggerated language when at the outset we stated that it may affect the health and well-being of thousands. The Municipal Corporations Act, by quickening the collective life of the towns years ago, made the inhabitants of the cities of England the masters of their own affairs, and in spite of many shortcomings the urban inhabitants of the country in every sense have become more prosperous and more healthy than those of any other country in the world. If when this measure becomes law—which it is certain to do, if not this session, then in the next, being one which is supported in principle by both the great political parties — it can hardly fail to have an equally beneficial effect in the rural districts. Doubtless, instances of mismanagement and extravagance, as well as of foolish parsimony, will be found from time to time, but undoubtedly it gives opportunities for great improvement in the material condition of the country people of



Side View of Shinto Temple.

England, which it is equally certain will be largely used, especially where individual energy is able to stir the collective force of a small community.

SOME NOTES ON JAPANESE ARCHITECTURE.*

BY F. T. PIGGOTT.

IN the temple roofs, which are perhaps the most remarkable feature of Japanese architecture, the straight line of the house roof becomes a beautifully proportioned curve. The accompanying architectural drawings reproduce the lines with great fidelity. The main curve is, I think, a natural curve. The impression created on the mind is of the "sag" of a tightly-stretched tent, and this would give a catenary with one of its extremities much lower than the other. But the architects do not limit themselves to one curve. If the elevations are examined, two such curves will be seen. The upper line is, of course, the curve proper of the roof; the lower one is that of the gabled end. In the case of the entrance gate to a Shinto temple, Fig. 8, it will be seen that the extremities of these two curves are coincident; in the case of the Bell Tower, Fig. 9, the gable-curve does not extend to the full length of the roof curve. And yet another curious feature. The sweep of the front of the roof is nearly always longer than that of the back, so that it may cover the steps up to the temple door, as will be seen in the large drawing of the side view of a Shinto temple. And, as one would expect with natural curves, those of the front and of the back are not identical.

The description of these curves is exceedingly difficult, for the gable curve (the lower line in the elevation) is much deeper than the curves of the roof. The timbers of the gable project from the end of the roof about 18 in., and the lead with which it is covered droops from one curve to the other; it forms a short veil, and corresponds to a loose overhanging end of canvas. It is from 18 in. to 2 ft. in width, and being joined, not only at both ends, but also at one side along its whole length, has a peculiar graduated "sag" of its own. Let us imagine the side of a canvas tent 44 ft. long, the extreme peg-ropes from the uprights 40 ft. apart; only so that there is a loose flap of canvas at either end, 2 ft. broad; and imagine further these two loose flaps to be caught up at both extremities by the ropes which support the tent in the direction of its length, then the outer edges of these two flaps will obviously sag to a deeper curve than that of the tent itself. There are minor modulations of the curves at the corners, or where curve meets curve at the joining of the smaller dormer gables with the roof. This seems to be the origin of the sweep of the temple roof, which in miniature is full of graces, and in its larger sizes is full of grandeur; or, if doubts as to whether tents were ever used in Japan throw doubts as to the suggested derivation of the curves, we must content ourselves with saying that a tent put up in the manner suggested would reproduce the curves of the roof with great fidelity.

But the purely mechanical construction of the roof sinks into insignificance when compared with the intricate joinery of the nests of brackets with which the overhanging eaves of the roof are supported. They appear in the small illustrations under the roofs in figs. 10 and 11, under the balcony of the upper story, and often also under the balcony which runs round the base of the building, as shown in the large drawing of the temple. This lower balcony is one of

* Concluded from p. 263.

the great features of the temples; it is, in Buddhist temples, usually finely lacquered in either black or crimson.

The illustrations from temples given with this article show, in Fig. 7, two forms of the covered entrance to a Shinto Temple; in Fig. 8, the side view of such an entrance; in Fig. 9, a Shinto Bell Tower; in Fig. 10, the Tower Gateway to a Buddhist Temple; in Fig. 11, the Buddhist Bell Tower; and finally the side view of a Shinto Temple.

NOTES.

THE Hull Dock strike has rapidly developed into one of those bitter struggles in which the origin of the dispute is soon lost sight of in the excitement of subsequent events; and as the success of the appeal to public sympathy in the case of the London docker will doubtless prompt a similar appeal in the present dispute, it is as well to note that the two cases are not analogous. The circumstances under which the London dock-workers contended for their "tanner" differ from those of the Hull dispute, inasmuch as no specific wage-rate enters into the latter, although apprehensions of forthcoming reductions doubtless prompt the Hull dockers' action—which may fairly be described as an unblushing attempt at coercion. The "tyranny" about which so much is generally heard in connexion with strikes is certainly not on the side of the shipowners, who simply claim a right to employ whom they please. The reverend gentlemen who waited upon them on Saturday with conciliatory intent were informed that the situations left by the men were still open for them, on the condition that they made no distinction between Unionist workmen and other workmen. But this does not accord with the Unionist idea of freedom, and the labourer who is sufficiently independent to keep aloof from their organisation is assailed with every reproachful epithet—as well as the employer who is rash enough to offer him work. Of course, it is not disputed that free labour generally means cheap labour, and the antipathy of the Unionists—who have obtained considerable advances in wages since their formation—is not unintelligible. But, on the other hand, it cannot be denied that organised labour is rapidly becoming too dictatorial for the extension of commercial enterprise. Messrs. Wilson have once withdrawn from the Shipping Federation, under the impression that they could deal better with their men direct, and even took an active part in the formation of the local Dockers' Union. But, according to the *Times*, they have been so harassed by the Union, that they again joined the Federation, and commenced to engage men irrespective of their being Unionists or not—this being the sole cause of the block upon their vessels. For the Unionists to work side by side with men engaged through the Shipping Federation would be, we are told by a labour organ, "to throw over the whole principle of trade unionism, and in their own interest the men on strike would be wiser to starve than resume work on such conditions." This in the face of a statement in the same journal, that the "Labour candidate" for Central Hull advised the dockers not to refuse to work with free labourers, and that their energetic champion, Mr. Ben Tillett, was also entirely opposed to the strike of the federated societies.

THE two opposite ends of Eastbourne offer a curious example of diversity of taste in building at the interval of a few years. The central portion of what in modern parlance is called the "sea front" consists largely of hotels, and where it does not, the houses are in the regulation hotel style always adopted from a quarter to half a century ago for the more showy and expensive class of seaside lodging-houses. At its eastern end, however, Eastbourne has pushed out further extensions not many years ago, in the shape of rows of less sumptuous lodging-houses which have all the formality and dulness of the older ones in the centre, without their pretension to semi-palatial dignity; and more depressing rows of buildings than those eastern continuations of the "Front" could not well be imagined. But at the present moment Eastbourne is extending her bounds westward, where a whole new "residential quarter" of terraces and semi-detached houses (mostly the latter) is springing up. Here, as if by a natural recoil from the architectural ugliness and uniformity of the east end, we find on the contrary a kind of restless striving after picturesqueness and variety which forbids any two houses, or at all events any two blocks, to be alike, and which seems to drive the builders into all kinds of eccentric efforts to arrange their windows and roofs and bays in some unexpected and individual manner. The intention is creditable; it is better than the monotony of the eastern terraces; but it has been overdone, and (though a few of the houses are really pretty) there is a sensation of fussiness and want of repose about the domestic architecture of this new neighbourhood which is a little irritating to the eye and mind. We may observe that between the centre and the new eastern portions (a little beyond the Queen's Hotel) there are left a few of the old Eastbourne "front" houses, of probably the early part of the century—some of the old houses with large circular bays running up to the eaves—which, in their real picturesqueness combined with simplicity and dignity of character, might have formed a good model for some of the modern houses; but we see nothing like an imitation of their style anywhere. While on the subject of Eastbourne, we may call the attention of the Sanitary Authority there to the state of the brick shelters which are built at intervals along the lower level of the promenade. The interior corners of these, which are never swept by the wind, are also apparently never swept by anything else, and become pockets for the accumulation of rubbish, old papers, orange-peel, and other "matter in the wrong place." To send a man round them with a besom in the morning would not cost the Corporation very much, and would remove a pretty frequent cause of complaint among visitors.

CLAPHAM has been largely rebuilt in recent years, but it yet retains a good deal of "slum" property which gives trouble to the local authorities. A very large proportion of this objectionable property is on land in which the Ecclesiastical Commissioners have an interest, and it is to the credit of the Church that a large area of insanitary dwellings is about to be cleared. Just ninety-nine years ago the then Rector of Clapham, the Rev. Henry Venn, was, by a special Act of Parliament, permitted to let the glebe land for building. The inevitable result, underleasing, followed, and a lot of wretched wooden houses were "run up" under the very shadow of the fine mansions in which the Thorntons, the Macaulays, and other celebrities have dwelt. Over and over again Clapham vestrymen have declared the houses in "Bromell's-passage," "Waterloo Retreat," and other places shut in by "The Pavement," "Grafton-square," and "High-street" to be dark, insanitary and "the resort of bad characters," but little, apparently, could be done until the leases expired. The leases are now running out, and the Rector, the Rev. C. P. Greene, intends to vastly improve the property. Five beershops and one public-house will be done away with, and three new roads—one to be named after Henry Venn—will be formed. Certainly the most picturesque houses, if they deserve the title, in old Clapham will be demolished. No one walking along the High-street towards the Common would dream of the close proximity of so many wooden houses, vine-covered here and there, with red-tiled roofs and quaint gable ends altogether unlike what one sees in modern dwellings. "The Rectory Estate," Clapham, was well known to a few artists, who often made studies of the old houses and picturesque gardens now degenerated into "barn-yards." Kenny Meadows, the well known artist, lived over a sweetstuff shop close to the glebe land, and many a picturesque bit of old Clapham was introduced into his "Illustrated Shakspeare." Clapham vestrymen have hailed with delight the removal of the old "rookeries," and we understand that they are taking care that the 700 persons or so who will have to be rehoused shall suffer as little inconvenience as possible. The Rector intends to build, in one of the new roads, a recreation hall for the use of the parish.

THE new number of the *American Journal of Archæology* (Jan.-March, 1893) is unusually strong in original papers, a fact which we are glad to note, as at one time the *Journal* seemed likely to lapse into little more than a *résumé* of the work done by others. The first paper on "The Temple on the Acropolis burnt by the Persians," by Mr. Harold N. Fowler, contends (1) that Pausanias does not mention the temple excavated in 1886, and (2) that the existence of that temple during the latter part of the fifth and fourth centuries is not proved. Mr. Tarbell follows with a useful tabular view of the subjects of the principal sculptural decorations of all known Greek temples. The sculptured decorations included are pediment figures, metopes and frieze, acroteria and sculptured drums are omitted. The object is of course to provide material for establishing the relation between the sculptured decorations and the dedication of the temples. Mr. Brownson, of the American School, has a good paper, prompted by suggestions in a peripatetic lecture by Dr. Waldstein on the relation of the archaic pediment reliefs from the Acropolis to vase-painting—the relation, it is contended, is very close and immediate. The tympanum was at first either painted or filled in with a group in terra-cotta—the pediment was no exception to the general rule that the whole architectural adornment of the oldest temple was of pottery. In a paper on the frieze of the Lysicrates Monument, Mr. de Cou points out that the arrangement of the slabs is incorrect in the earliest publications, and the inaccuracy is repeated in subsequent standard publications—*e.g.*, in Overbeck's "Plastik." The correct arrangement is seen in the cast in the British Museum. Finally, Mr. John Pickard has a paper on the "Conjectural Site of the Shrine of Dionysos, ἐν Λίμναις, at Athens."

OUR German contemporary, the *Deutsche Bauzeitung*, publishes some interesting notes on the rapid increase of places of worship in Berlin since the commencement of the present Emperor's reign. Whilst during the thirty years preceding his accession to the throne only four churches were built in the Prussian capital, no less than twenty-six have been taken in hand during the last four years, and there is every prospect of another forty having seen their completion by the end of the present decade.

Of the twenty-six churches started during the Emperor's reign seven have already been consecrated, whilst the rest (with the exception of a memorial church to the late Emperor William) have to be finished by the end of 1895. The memorial church alluded to will cost about 200,000*l.*, and will hold a congregation of 2,000. The architect of this building, Herr Schwechten, intends having a spire about 117 mètres high, and using a good free stone for his façades. Herr Schwechten has also two other churches in hand, Herr Spitta has five of the twenty-six, Herr Orth has four, and Messrs. Moeckel, Adler, and Otzen two or three each. The total cost of the churches in course of erection, their fittings and sites they stand on exceeds 750,000*l.* 13,000*l.* is the usual cost of the more dignified churches with a thousand seats, a spire and vaulted naves and aisles, but this sum does not include the church furniture and fittings. Churches of a simpler kind for congregations of 850 and wooden roofs are generally estimated at 6,000*l.* With the exception of three cases the parishes did not have to pay for their sites themselves, as the Government, the Municipality, or even private individuals have been the donors in due accordance with views expressed by the Emperor and the example set by his Court.

IT is understood that the Queen has accepted the patronage of the so-called "International Fire Congress," to be held in June, and which we hope may prove itself deserving of this distinction. In those continental countries where fire protection ranks as a science, a congress of firemen really means a meeting of experts in fire-fighting, architects, engineers, and public servants, to discuss questions relating to the general protection of communities or separate risks. In some cases on such occasions we find a brigade showing some new special drill, or a maker some novel apparatus, but in no case are these exhibitions the main object of the gathering. The proposed Agricultural Hall "Congress," however, appears to be a very different affair—*i.e.*, a kind of Military Tournament without the substantial *raison d'être* of collecting funds for deserving charities. Drill competitions, races, and showy parades are the main events, then comes a trade exhibition, and if we understand rightly, we shall also see some fire relics, hear a few papers read, and have some 3,000*l.* spent in entertaining distinguished visitors. Competition drills and parades may further the efficiency of individual firemen or brigade-units, but fire brigades, like military bodies, cannot be judged solely by the abilities of their most agile and specially coached members. The intelligence and athletic power of the raw material from which our brigades are recruited may probably rank first in the world, and an exhibition of the smartness which can be drilled into such material will always be interesting. Unfortunately, however, the advantages of the brigades having good material are mostly counterbalanced by the irrational organisation of these forces and the unscientific training of the officers in command, whilst it should also be remembered that in reality even the best organised and most efficient brigades play but a minor *rôle* in modern schemes of fire protection. Preventive measures rank far higher than the actual defensive ones, and the energy expended by the "Fire Brigades Union" Committee might be more usefully employed in furthering legislation for preventive purposes than in arranging the proposed displays of the "Congress."

IT is certainly high time that a National Society for checking the abuse of public advertising should be formed, and the society for that purpose, whose programme has just been made public, may do very good service. Little can be effected in these days by individual effort; but collective work and adequate funds may do a great deal. The society in question will busy itself mainly with the question of large public advertisements such as skysigns, those on hoardings, buildings, and so forth. We hope also that they will take in hand the abuse of advertising in railway stations, where great inconvenience is caused by the name of the station being practically lost in the surrounding advertisements. The list of members who have already joined the Society includes the well-known names of Mr. W. E. H. Lecky, Mr. A. Waterhouse, and Mr. Alfred Austin, not to speak of others. A duty on advertisements, which is one of the points now under their consideration, would probably be a useful aid to local taxation, and if it were placed heavily on the larger kinds, would effectually check those which are most to be censured.

THE commemoration last week of the deaths of Barrowe, Greenwood, and Penry, known as the "Congregational Martyrs," recalls some events in the history of Southwark and its now nearly vanished prisons. The former two were taken to the Clink, and suffered at Tyburn on April 6, 1593; Penry, on May 29 following, at the Elms, close to St. Thomas à Watering, by the southern point of St. George, Southwark, parish. Comparing old and modern maps we find that the gallows, and the brook, flowing from the slopes of Nunhead and Peckham-rye, were situated by the present junction of Albany and Old Kent-roads.* Penry, a resident of Long-lane, Southwark, had been confined in the Borough Prison, that is to say, the old Marshalsea, on the eastern side of Borough High-street, between Mermaid-court and Newcomen, formerly King, street—the Axe and Bottle-yard of Rocque's map, 1746. The old Marshalsea extended eastwards to a once open sewer in the Bowling-green, where they used to set up booths for Southwark Fair. A short distance southwards, on the same side of the way, stood the old King's Bench and Queen's Bench, its site now marked by Layton's-buildings and Layton's-grove, *prius* King's Bench-alley. Between the old Bench and St. George's Church—depicted, in the distance, in Hogarth's "Southwark Fair"—was the White Lion, originally an inn, converted into a gaol *circa* 1558, whence John Rigby, *temp.* Elizabeth, was taken to the Elms. When the White Lion fell into disrepair a new Bridewell was built, *circa* 1770, on Hangman's Acre, at the junction of Higler's-lane (now Friar-street) and Great Suffolk-street, and north of the site of the later King's Bench, which latter was pulled down in the winter of 1881-2. In 1811 the White Lion site was acquired for the new Marshalsea, built at a cost of 8,000*l.*, and used until fifty years ago for debtors, pirates, and smugglers. This is the Marshalsea wherein the late Charles Dickens, lodging in Lant-street, used to visit his father, and which he describes in "Little Dorrit." Ten years ago we went over the debtors' side, chapel, and Admiralty prison, the last-named then serving for a cheap lodging-house. A firm of iron and hardware merchants have lately taken, and made changes in, the premises, so that the public can no longer enter the prison yard from Angel-place.† But in the ground-floor of No. 211, High-street, which occupies the site of the prison forecourt, turnkey's "lock," and keeper's house, one may still see the four posts and cross-beams with their brackets of the two prison-gates; in the rear is the four-storied block of eight houses, built in two rows back to back, containing fifty-six rooms and surrounded by a narrow courtyard, which formed the debtors' prison. Horsemonger-lane Gaol, designed by Gwilt, was closed on August 31, 1878, and the prison, within the walls, was pulled down two years afterwards. On May 5, 1884, Mrs. Gladstone opened part of the ground as a public garden.

* And forth we riden a litel more than pas,
Unto the watering of seint Thomas,
And there our host began his hors arrest.
CHAUCER.

† Formerly Bridewell-alley: named after the Angel Inn, and the abode of Doggett, the comedian, *ob.* 1721. Shaw's-court, next to the church, has been renamed New-alley, but is known as Coroner's- court.

THE exhibition of the New English Art Club, now open at the Dudley Gallery, shows the usual proportion of the grain of wheat to the bushel of chaff. Mr. Walter Sickert affords evidence, in his life-size portrait of the late Mr. Bradlaugh at the Bar of the House of Commons (8), that he can paint a really fine portrait, both in regard to execution and expression, when he chooses; why, being able to do so, he should choose to exhibit such a daub as the "Portrait of Mr. Roussel" (99), or "Miss Geraldine Blunt" (52), it is impossible to understand, any more than one can understand why Mr. Fred Brown should choose to exhibit "A Portrait" (59) of a woman with a texture of skin which gives the idea that she had suffered from a virulent attack of smallpox; or why Mr. Wilson Steer should paint the face of a young girl (85) as if it were made of parchment, both as to colour and modelling. In regard to these and many other of the exhibits, it would appear that art in the New English Art Club is not the search after beauty, but the search after ugliness; or absurdity, if we judge by such travesties as Mr. Wilson Steer's "Yacht Race" (54), which it is fortunate for him that few yachting men are likely to see. Mr. Wyllie sends some charming little sea and coast pictures, and Mr. Mark Fisher is seen at his best in "Winter Fodder" (86), and "An Inappreciative Audience" (92), but neither of these are painters epecially sknown in connexion with the New English Art Club. Mr. Furse's large hunting portrait is very well drawn and full of character in man, horse, and dogs but most unaccountably dingy in tone. Among smaller works Mr. Brabazon's "Fishing-Boat Sails at Chioggia" (4) and "On the Riva dei Schavoni" (12) are brilliant bits of colour study; Mr. Holloway shows fine qualities of composition in "Lambeth" (41) and "The Breakwater" (96), the swing of the water in the latter is well conveyed, but in both it is odd to observe a painter in this "progressive" exhibition practically going back to the colouring of Callcott. Next to the portrait of Bradlaugh, the most noticeable work in the exhibition is Mr. Christie's "Pied Piper of Hamelin" (102) which is a remarkable realisation of the legend, both in the weird figure of the Piper and the crowd of delighted children's faces which are seen in perspective behind him: the treatment of the rather hackneyed subject is quite new and original.

THE special point in the exhibition at the French Gallery, which opened on Monday, is the presence of a number of works by the clever Spanish painter, Professor Pradilla, who is talked of as a successor of Fortuny, but some of whose smaller works might dispose one to regard him as (*longo intervallo*) the Spanish Meissonier. Professor Pradilla does not, in fact, appear to have any very fixed style or aim in painting; his two large works in the exhibition, both from the history of the conquest of Granada, are not more than well-executed "historical paintings" of the regulation style; but there is considerable originality as well as brilliancy of execution in some of the smaller ones. Among these are "Happy Childhood" (33) and "A Summer's Morning" (48), for minute study and expression in small scale figures; "The Stations of the Cross in Holy Week" (38), a scene in a convent enclosure in Spain, fine both in colour and composition; and one or two sea studies (30 and 60, for instance). The studies of horses for the larger paintings are very good. Among the other works are various little bits by old favourites, Cazin, Van Marcke, Heilbuth, &c., some large paintings

by Heffner, in which the effects are more conventional and the water more metallic than ever; and a small painting by Kühn, "In the Studio" (25), an eighteenth-century scene with little point or meaning in the subject, but remarkable for its splendid qualities of texture and colour.

MR. MORTIMER MENPES'S collection of small oil studies in Spain have about the same kind of merit as his former collection from Japan; they show an eye for effects of colour and for seizing the picturesque elements of a group or a situation, but there is a good deal of sameness about them, and they give the impression of being rather easily produced. Moreover, we disapprove altogether of the indicating the roughness of wall-surfaces, &c., by roughness in relief in laying on the pigment—a most false practice in painting. Mr. Menpes appears to have made a hit with this kind of painting of impressions on a small scale, and has become to a certain extent a fashion; but this kind of thing will not go very far, and if the artist can (as we imagine) do something more serious than this, it will be well for him to aim at it without delay.

AN International "Exposition" of Medicine and Hygiene is announced to be held at Rome in September and October of this year, which is not however, we presume, to be confounded with the "Hygienic Congress" of which the last meeting took place in London. Among the subjects to be considered are apparatus and plans of buildings for technical research; service and apparatus for "*assistance et sauvetage*;" plans and models for the sanitation of towns; plans, models, and materials of hygienic construction, and plans and models for artisans' dwellings, &c. Those who require further information should apply to the office of the President, Professor Pagliani, Ministère de l'Intérieur, Rome.

THE *Northern Echo* of Monday last states that the Darlington Town Council have decided to erect new Municipal Buildings (including a Town Hall "measuring at least 100 ft. by 85 ft."). The designs are, it is stated, to be sent in to the Council by *December* 31, and the Municipal Buildings Committee will have the assistance of an architect of repute in deciding on their merits. The author of the selected best design will receive 150*l.*, which, however, "will be merged in his 5 per cent. commission on the total cost of the building *should he be* entrusted with the carrying out of the undertaking." The second and third best designs will be awarded premiums of 100*l.* and 50*l.* respectively. The local journal speaks of this "latest development of municipal enterprise" somewhat dubiously on the score of its want of expeditiousness, but consoles the ratepayers by telling them that they are not committed by it "to the payment for even a single brick, because after getting the designs and deciding on their merits *the Council may postpone the work indefinitely*." (The italics are ours.) We fear that the terms of the competition will not be very alluring to architects of repute.

THE PIER FOUNDATIONS OF THE TOWER BRIDGE.

A PAPER by Mr. E. W. Cruttwell on the Pier Foundations of the Tower Bridge was read a few days ago before the Institution of Civil Engineers. The paper only deals with the foundations of the bridge, and does not describe the superstructure which is still under construction. It will be remembered that besides the two abutments on each shore, there are two very massive piers in the river, and as these are similar in all respects, a description of one of them will be sufficient to convey a general idea of the work. The total load on the foundation of each pier is estimated at 68,700 tons, and as it was thought expedient to limit the pressure on the London clay, upon which the piers rest, to 4 tons per square foot, the required area of each foundation is given by making the pier 204½ ft. long, by 100 ft. wide, thus forming, we believe, the largest pier of its kind in the world, and one which in area is equal to the four large circular piers of the Forth Bridge taken together.

It was essential to adopt caissons of some kind for laying the foundation, because timber cofferdams were specially prohibited by the Act of Parliament. Instead of sinking large caissons, extending right across the pier, a system of smaller ones around its circumference was adopted, each of which was 28 ft. square. The caissons at each end of the pier were, however, triangular in shape, forming the cutwaters.

As the Thames Conservancy insisted on a clear waterway of a width of 160 ft. alway being maintained, it was impossible to build both of the foundations at the same time, as the clear space between them is only 170 ft., and a certain width of staging was required all round each pier for the cranes and other plant used in their construction. By adopting the small caisson system it was possible while building one pier, to be also laying the foundation for the shore side of the other, and still conform to the demands of the river authorities.

The caissons were in two portions, the lower part, or permanent caisson, being 19 ft. high, and the upper part, or temporary caisson, being 38 ft. high.

Each portion consisted of a single skin of wrought-iron plates, ½ in. thick, at the bottom of the permanent caisson, and diminishing to ¼ in. thick at the top of the temporary caisson. The sides of the caissons were stiffened by angles and timbers. The caissons were not sunk quite close to each other, but a space of 2½ ft. was allowed between each, and timber piles were afterwards driven between them, making this space watertight. The material excavated was London clay, covered in places by about a foot of ballast, and so compact that it was found the caissons could be pumped dry after they had been sunk some 5 ft. into it.

The excavation inside the caissons was done by Priestman's grabs, but divers were employed to remove the material from the sides, and shovel it to near the centre, where it could be lifted out by the grabs. The caissons were sunk to some 28 ft. below the bed of the river, and when they were only 6 ft. below, it was considered safe to pump them dry. Pumping was commenced a little before the time of half-ebb, and took about two hours, by which time the tide had fallen to within 3 ft. of low water. Navvies were then sent down and worked for three hours filling skips, until the rise of the tide made it necessary to stop work. As the depth of sinking increased, the pumping was commenced earlier, so that more time for working at the excavation was obtained. The rate of sinking was 8 in. a day from the time it was commenced until the pumps were at work, but when the caissons could be pumped dry, and the material could be excavated by the navvies, the daily rate increased to nearly 4 ft. The sides of the caissons forming the circumference of the pier were undercut 5 ft. beyond the cutting edge, and 7 ft. beneath it, to increase the area of the foundations, and after this was done the caissons were filled with concrete consisting of six of Thames ballast to one of Portland cement, which was lowered into place by skips, an interval of a day being generally allowed for each layer to set before proceeding further.

Over these permanent caissons the pier was faced with rough picked Cornish granite, in courses of 2 ft., and 2½ ft. in height, with a lining of brickwork, all the work being set in Portland cement mortar.

The erection of the first caisson was commenced in September, 1886, but it was not until January, 1890, that both piers were completed up to the limits of the contract, namely, 4 ft. above T. H. W. This long time was due chiefly to the fact above-mentioned, that the two piers could not be built simultaneously, and also to the many other hindrances caused by the limited size of the staging, and the restrictions imposed by the Thames Conservancy. The total cost of the two piers, including all temporary works, amounted to 111,122*l.*, equal to an average cost of 2*l.* 3s. 7d. per cubic yard. The engineer for the bridge is Mr. J. Wolfe Barry, and the work was carried out by Mr. John Jackson, contractor.

In our opinion the most important question in connexion with this work is whether four tons per square foot is not too small a load to allow on the London clay. There is no doubt that considering the complicated nature of the machinery placed on each pier to work the opening portions of the bridge, it was necessary to provide against any subsidence, yet the load per square foot cannot but be regarded as very small, especially when it is remembered that no allowance has been made for the water and material displaced by the piers. In the Charing Cross bridge the pressure on the foundations is double the above amount, but even if the pressure allowed in the Tower Bridge piers was increased by only 25 per cent., the saving in the cost of the work would have been very considerable. Taking only the cost per cubic yard, it will occur to those who have had experience in this kind of work, that its cheapness is due to the immense size of the piers themselves, and must not be taken as indicating the cost of similar work on a smaller scale, where the plant used and general expenditure could not be spread over so large a cubic contents.

The work was, however, done cheaply, especially when it is considered the long time it took, and the many delays met with in the execution of the contract.

THE MAUSOLEUM AND ITS SCULPTURES.

DR. A. S. MURRAY, Keeper of the Greek and Roman Antiquities in the British Museum, recently delivered three lectures, on "The Sculptures of the Mausoleum," to the students of the Royal Academy. He commenced the first lecture by incidentally pointing out that in mediæval history a conspicuous part was played in the south-west corner of Asia Minor. It was there in particular that the Knights of St. John, after their expulsion from Jerusalem, erected a series of fortresses of immense strength. Establishing themselves first in the adjacent island of Rhodes, they subsequently, in 1402, obtained the permission of the Sultan to build a new castle on the site of the ancient Halicarnassus, then and now call Budrum. That was the Castle of St. Peter, a place of great strength, still jealously guarded and maintained by the Turks. Its erection was carried out by a German knight, Schlegelholt, and he no doubt availed himself freely of the masonry which lay abundantly to his hand in the town of Halicarnassus, and particularly in the ruins of the famous Mausoleum. At all events we knew that when, about a century later, repairs and additions were in progress at the castle, it was to the ruins of the Mausoleum that the Knights turned for material. A sixteenth century French writer, named Guichard, quoted by Sir Charles Newton, gave an interesting description of the way in which the steps and other portions of the Mausoleum were despoiled for the repair of the castle. The writer referred to spoke of the discovery and exploration of the interior of the Mausoleum by those who were thus in quest of building stone, who found themselves in a "fine large square apartment, ornamented all round with columns of marble, with their bases, capitals, architrave, frieze, and cornices, engraved and sculptured in half-relief.

"The space between the columns was lined with slabs and bands of marble of different colours, ornamented with mouldings and sculptures in harmony with the rest of the work, and inserted in the white ground of the wall, where battle scenes were represented sculptured in relief. Having at first admired these works, and entertained their fancy with the singularity of the sculpture, they pulled it to pieces and broke up the whole of it, applying it to the same purpose as the rest. Besides this apartment, they found afterwards a very low door, which led into another apartment serving as an ante-chamber, where was a sepulchre with its vase and helmet of white marble, very beautiful and of marvellous lustre. This sepulchre, for want of time, they did not open, the retreat having already sounded. The day after, when they returned, they found the tomb opened and the earth all round strewn with fragments of cloth of gold, and spangles of the same material, which made them suppose that the pirates who hovered along this coast, having some inkling of what had been discovered, had visited the place during the night and had removed the lid of the sepulchre. It is supposed that they discovered in it much treasure. It was thus that this magnificent tomb, which ranked among the seven wonders of the world, after having escaped the fury of the barbarians . . . . was discovered and destroyed to repair the Castle of St. Peter, by the knights of Rhodes, who immediately after this were driven completely out of Asia by the Turks."

It was believed that the slabs mentioned in that account as having been sculptured with battle-scenes in relief were the thirteen slabs of the frieze which were afterwards found let into the walls of the castle in a decorative manner, and if that were so it spoke so far for the good taste of the knights that they not only rescued these sculptures, but placed them where they would command attention. As time went on, an occasional traveller made his way into the Castle of Budrum, and mentioned the existence of these reliefs. At last, Dalton made drawings of them, and published the same in his book of "Views of Greece and Egypt" between 1751-1781. The reliefs were

thus brought before the learned world, and their importance recognised in a general way. In 1846 Lord Stratford de Redcliffe, who was then Ambassador at Constantinople, and a man of great influence, persuaded the Sultan to allow him to remove the thirteen slabs and present them to the British Museum. On the arrival of the slabs, Mr., now Sir Charles Newton, set himself to see whether the general belief that the slabs belonged to the Mausoleum could be proved, or at least reasonably confirmed. He published a memoir on the subject, accompanied by a plate showing a conjectural restoration of the Mausoleum by Professor Cockerell. The effect of renewed study and speculation on the subject was to create a desire, on the part of Sir Charles Newton, to explore what he believed to be the site of the Mausoleum. Having obtained the aid of the Government of the day, he set out in 1856. For a time his excavations were fruitless, so much so that he had fixed a particular day on which he would abandon the task should he not in the meantime strike on the right track. The morning of that day arrived, there remained only a few yards of a trench to be cut, and fortunately the cutting of it led to the enclosure wall of the Mausoleum. Thenceforward the work of clearing the site went on apace. The destruction was found to be very thorough. It had been begun apparently by an earthquake, which had brought down the building with a crash. The Knights of St. John had helped themselves to its finely-worked marble blocks. The ships of the Venetians and Genoese were constantly in those waters, and probably they had carried away much more than the single slab of frieze which we obtained from Genoa in 1866. Nevertheless, there still remained a rich harvest of sculpture and architectural members for Sir Charles Newton to rescue and bring to London. Having thus given a brief outline of the modern history of the Mausoleum, the lecturer turned to ancient times, and referred to Mausolus, Prince of Caria, after whom the Mausoleum was named—the Mausoleum being so splendid that the Romans, when they erected great and costly tombs to their Emperors, designated them "Mausolea." Thus, in Rome, the building, now converted into a fortress, known as the Castle of St. Angelo, was originally called the Mausoleum of Hadrian. When Mausolus transferred his seat of government from the inland town of Mylasa to Halicarnassus, he marked his advent by building a new palace, of which we were told the interesting fact that while the decorative parts of the building were executed in Proconnesian marble, the walls themselves were made of brick, over which was a coating of plaster polished till it had the appearance of glass; the writer who recorded that circumstance added that the use of brick was not due to the poverty of the king, for he had become rich from the numerous taxes imposed by him on his people. By all accounts Mausolus was unscrupulous in the burdens he placed on his subjects. We read of his having alarmed the people of Mylasa, his old capital, by announcing the probability of a war, and asking for money for a new wall of defence. They subscribed the money and sent it to him, but he never built the wall. That, and some other incidents which had been handed down of a more or less mean character, suggested that Mausolus had a good deal of the old Carian blood in his veins. His long hair and short beard reminded us of the ancient type of the Gauls, who, in their seats in Asia Minor were almost neighbours of the Carians. At the same time, his face seemed to the lecturer to have become strongly Hellenised, and in a measure incongruous with the manner of wearing the hair and beard which was probably in strict accordance with a national custom among the Carians as among the Gauls. A comparison of the fine head of a barbarian chief, in the British Museum, with the head of Mausolus, would show the difference which had been brought about by contact with the Greeks. When Mausolus died in 353 B.C. it was certain that any monument erected over his tomb would find in so rich and populous a city as Halicarnassus an abundance of spectators well skilled to judge in matters of art and architecture. Without bearing these circumstances in mind, it might be thought strange that Greek sculptors of the foremost rank like Scopas should have left the more natural scene of their labours in Greece itself, at the invitation of a semi-barbarous queen, to decorate her husband's tomb. The result of their labours became, as we knew, a household word in Greece and throughout the Roman Empire, the Mausoleum being counted as one of the seven wonders of the ancient world. It was a curious idea that of the seven wonders; it was not an idea that dated from good Greek times; it was a later and more or less degenerate conception, such as suited writers like Philo of Byzantium. From one writer to another the seven wonders varied a good deal, but generally they were:—(1) the hanging gardens of Babylon, (2) the walls which Semiramis constructed round Babylon, (3) the pyramids of Memphis, (4) the Colossus of Rhodes, (5) the tomb of Mausolus, (6) the Temple of Diana at Ephesus, and (7) the gold and ivory statue of Zeus at Olympia. Though the references to the Mausoleum in late Greek and Latin writers were frequent, there was practically only one of them that gave a useful description, and even that was very defective. Pliny, in speaking of the works of the sculptor Scopas, said:—

"In the same period Scopas had as rivals Bryaxis, Timotheos, and Leochares, whom I would mention together, as they were associated in the work of decorating the Mausoleum with sculpture. On the south and north the Mausoleum extends 63 ft., being shorter in the fronts. Its entire circumference is 411 ft. It is raised in height 25 cubits (equal to 37 ft. 6 in.). Round it are thirty-six columns; the part surrounding the tomb was called the *pteron*. The sculpture on the east side was by Scopas, on the north by Bryaxis, on the south by Timotheos, on the west by Leochares. Before these artists had terminated their labours Queen Artemisia died, but they did not cease from their work till it was completely finished, regarding it as a monument of their own fame and art. To this day it is a matter of dispute which of these masterpieces is the finest. With these sculptors a fifth artist was associated. For above the *pteron* a pyramid equalled the lower part in height, contracting by twenty-four steps to a point like that of a *meta* (or goal in the circus race). On the summit is a marble chariot with four horses, the work of Pythios. The addition of this made the height of the entire work 140 ft."

So far Pliny, as translated by Sir Charles Newton. Now there would be nothing extraordinary in a height of 140 ft. from a modern point of view, in a building with a high pyramidal roof, but there were many critics who objected that the chariot group could not have been visible at such a height; that the sculptures of the chariot group were finished with much detail; that all that detail would have been lost; that the statues of Mausolus and Artemisia (who were supposed to have stood in the chariot) would have been invisible; and so on. But why not dispute the measurement of 140 ft. which Pliny gave for the entire height, especially when another ancient writer gave the height at about half that figure? The difficulty was that if we once began to alter one of a set of calculations in an ancient writer, we had to make sure that it was the only one which required emendation, and that the context itself pointed the way to the necessary change. So far as he (the lecturer) knew, that principle had only been applied once in a satisfactory manner to that passage of Pliny, and that was a year or two ago by a German archæologist, whose view of the question was as follows:—Pliny stated first the height of the order (or *pteron*, as he called it) to be 25 cubits. He then went on to speak of the sculptors who had been employed in decorating that part of the building, after which he returned to the question of height, and said that the roof was in the form of a pyramid equal in height to the lower portion of the building. He must therefore have mentally calculated that the height of the building, so far, was 50 cubits (75 ft.). But subsequently, when he came to speak of the chariot on the top of the pyramid, he gave the entire height as 140 ft., thus leaving 65 ft. to be made up somehow without any indication on his part as to what it consisted of. It was argued that Pliny, having previously doubled in his mind the height of the order, had again, by a mistake, redoubled it. Had he meant us to understand, as most modern critics had understood him, that there was also a lofty podium or basement of about 65 ft. on which the whole structure was raised, he would have said, or ought to have said, if he wished to be grammatical, that the pyramid was equal in height, not to the lower part of the building, but to the middle part. That was a view which commended itself the more because, as already mentioned, another ancient statement put the height of the Mausoleum at 80 ft., which was sufficiently close for reasonable purposes. Of course, it might be replied that a lofty basement, if it were undecorated, need not have been taken into account by the second writer, or even by Pliny, when he was giving the dimensions of the order of the pyramid, while, at the same time, Pliny might have taken it into account when summing-up the entire height of the monument. That was all possible enough as speculation; but it was to be remembered that in excavating the site no evidence was found of that immense basement, which surely would have stood after all else had fallen in ruins. The lecturer said it was not for him to go into architectural questions, but he thought that surely a basement of the enormous height of 65 ft. must be wrong. Those famous Greek sculptors, who completed their work at their own expense, would hardly have been willing to do so if the fruits of their labours—such, for instance, as those friezes in comparatively low relief—were placed high up on a building which itself stood on an inaccessible podium of 65 ft. The lecturer would not say that there might not have been a fairly high podium: that seemed to have been a characteristic feature of the architecture of the locality; and, of course, there would be less difficulty if we could suppose that on the podium itself were placed the work of the four famous sculptors, much in the manner of the reliefs on the high basement of the Nereid monument from the same quarter of the world. It had, indeed, been suggested that the surviving friezes of the Mausoleum might have been thus placed on the podium. But against that it was quite plain that the Amazon frieze at least could have been nothing but the frieze of the order; the mouldings along the top and bottom of it were conclusive on that point, and even if it were not so, the suggestion would be in flat contradiction to the statement of Pliny that the four sculptors were employed on the *pteron* or colonnade, not to mention his total ignoring of any basement. In the opinion of the lecturer, the probability was great that the modern idea of a podium 65 ft. high was not a reasonable explanation in the circumstances, but that conclusion had not been arrived at solely in deference to the German view, which diminished the entire height of the building by one-half, and thus brought down the sculptures,—especially the chariot group,—to nearly the ordinary range of vision. So far as the chariot-group was concerned the lecturer saw no absolute impossibility in the height of 140 ft., if that was necessary. The Greeks did not expect everything they did to be seen and criticised, as was plainly shown by the Parthenon sculptures, and many another piece of first-rate work. In conclusion, the lecturer discussed the question why Queen Artemisia chose a high pyramidal roof for the tomb of her husband. He thought that the idea of the tomb was that of a pyre, derived from the funeral pyres of Babylon and Persia. Diodorus Siculus (xvii., 141) described the monumental pyre erected by Alexander the Great to one of his greatest generals, Hephæstion; and what appeared to be a similar monument, that of Sardanapalus was represented on a coin of Tarsus struck in the time of Demetrius II., B.C. 130—125. Both these structures appeared to have had pyramidal roofs. It was probable that Artemisia and the architects whom she employed for the Mausoleum recognised a Persian custom in giving a high pyramidal roof to the monument of a man who, though a prince in his own right, was also a Persian governor. The high pyramidal roof was an idea utterly foreign to the Greek mind. We could imagine that the Greek architects employed on the Mausoleum had found in the roof which had thus been prescribed for them a problem not at all to their liking. How far they had succeeded in obtaining an artistic proportion between it and the lower part of the building we could not yet say; but we knew that they took great pains in seeing that the masonry of the roof was as perfect as it could be made. Each block of marble was carefully fitted into the other so that the whole mass would hold well together, and yet be as light as possible. Every precaution was taken to protect the joints of the stones from the effects of rain and weather. We had many of these blocks in the British Museum. They afforded testimony to the skill of Greek workmen, although the roof altogether was an example of what the Greeks do not seem to have admired.

In his second lecture, Dr. Murray first of all proceeded to discuss the question of the causes which led to the selection of the chariot-group to surmount the pyramidal roof of the Mausoleum. There was, he said, a Roman coin on which was figured the funeral pyre of the Empress Julia Domna. On the summit was a flaming fire. That was a representation of an actual fact which could not be expected to satisfy, except for once in a way, a people of artistic taste. Even the late Romans, who might not have been models of artistic taste, usually required a symbol instead of a flaming fire. As an example, there was in the British Museum an ivory diptych, which represents the apotheosis of Romulus, son of the Emperor Maxentius, who died A.D. 308 when Consul. In the uppermost field were the gods of Olympus, amid clouds, and partly enclosed by the zodiac, waiting the arrival of Romulus, who was being carried aloft to them by two winged

genii. In the middle there was a small genius driving upwards a minute chariot of four horses and accompanied by two eagles. Immediately below them was a funeral pyre, from which the eagles had been let loose. In the lowermost field we saw Romulus himself seated in a car, which was in the form of a temple drawn by elephants. Now it sometimes happened that rude works of art such as the diptych in question exhibited a curious combination of actual present-day fact and of artistic symbols which had been prevalent many centuries before. The latter element was conspicuous in the pair of genii who bore up Romulus and the gods. They corresponded admirably with the pair of winged figures whom we frequently saw on Greek vases of the best period carrying away the body of Sarpedon. Both genii had small wings springing from their heads like our famous bronze head of Sleep. We might therefore identify them as Sleep and Death, and recognise in the ivory diptych an instance of how a piece of Greek symbolism which had been common in the fifth century B.C. recurred again in the fourth century A.D. Side by side with the artistic symbolising of the transport of an Emperor to the gods, we had, on the ivory, a practical record of how the body of a deceased prince was conveyed in a stately car to be burned on the pyre, and how his genius was supposed to escape in a chariot up to the gods. The ordinary usage of the Romans was to surmount the pyre of an Emperor with a representation of himself in his chariot, and the question was whether the chariot so placed was understood to be the chariot in which he was to rise to the gods, or the chariot in which his body was conveyed to the pyre. There was another Roman coin showing the funeral pyre of Antoninus Pius. On the top of the pyre the Emperor was represented standing in a quadriga and holding a palm-branch, like a victor in the chariot-race. Again, there was a coin showing the pyre of the Empress Faustina, this pyre being surmounted by a *biga*, or chariot of two horses. The usual explanation was that these chariots represented the apotheosis or translation of an emperor to the gods; but in the light of the ivory diptych that explanation was at least questionable, because there we saw Romulus, still in bodily form and substance, borne along in a chariot, while in mid-air the genius was seen driving up to the gods, and lastly the gods received the emperor. Whether or not it was intended that the minute chariot in the middle scene of the diptych should represent the vanishing pomp of the emperor, it was certain that in other instances of apotheosis it was usual to see the emperor ascending on the back of an eagle, a winged horse, or a winged genius, but never in a chariot. It might, therefore, be not unfairly concluded that on the coins in question the chariot surmounting the pyre was intended to represent the chariot in which the body of the emperor had been conducted in pomp to the funeral. Among the Romans the idea of placing a chariot on a height had long been familiar. We saw it on their triumphal arches and their city gates. The famous chariot which was placed on the apex of the Temple of Jupiter Capitolinus, in the early part of the sixth century B.C., was a case in point. In Greece, on the other hand, there were no instances of the erection of chariots on pyres, arches, gates, or temples, with possibly one exception. Pausanias spoke of having seen, at a little place called Celeæ, in the district of Corinth, a building which was known as the Anactoron. He gave no explanation of the name or of the character of the building, but he said of it that "towards the roof was placed a chariot, which they say was the chariot of Pelops." What could he have meant by "towards the roof?" The lecturer was of opinion that the chariot mentioned by Pausanias must have been outside the roof and on the top of it. Proceeding to speak of the Mausoleum chariot itself, the lecturer observed that if an archæologist without previous knowledge or prejudice were asked to explain it, he would unhesitatingly say that it was a marriage-chariot. He would argue that the only analogy for such a group in Greek art was what we saw so frequently on the archaic painted vases, where the gods were represented as about to start in a wedding procession — either a wedding amongst themselves or between some of their favourites. Artemisia could not have failed to be familiar with an idea which had been long current in Greek art; and it must be allowed that it was at least singular that the chariot group which she caused to be sculptured for the top of her husband's tomb should have no analogy among the remains of Greek art except a wedding chariot. When her husband died Artemisia was plunged into inconsolable grief, and apparently one of her first cares was to erect over his tomb the splendid monument of which we now had the remains. She invited the foremost artists of Greece, and exhausted her resources in what must have been an enormous expenditure. In these circumstances no artistic symbol could have better expressed her feelings than the chariot, which recalled at every moment the happiness of her married life. At the same time, we must not, so to speak, put that particular idea into her head without some sanction. At Greek funerals in the heroic age, as also on great occasions in historical times, there were races of chariots and athletic games which to our minds seemed more appropriate to marriage ceremonies. Numerous Athenian tombstones presented us with sculptured scenes which looked more like a reunion in Elysium than a parting on earth. No wonder that they had often been supposed to represent a meeting, in the after-world, of spouses who had been parted on earth. The lecturer said he readily allowed that these things did not prove so satisfactorily as could be wished that the idea of Artemisia, in making the roof of her husband's monument in the shape of a pyre and placing on it a chariot containing figures of Mausolus and herself, was to recall her actual marriage and to symbolise her belief in a re-marriage in Elysium; yet, taking all the facts into consideration, that seemed the best interpretation. The lecturer next proceeded to explain the view that had been current hitherto, viz., that the chariot represented the apotheosis of Mausolus. He said we happened to know what an apotheosis was thought to be like by the Greeks contemporary with Artemisia. As an example, there was a vase on which we saw Herakles being driven upwards in a chariot while his body was being consumed in the fire below. In that and similar instances the chariot was in the act of ascending rapidly, but that was certainly not the case on the Mausoleum; *there*, the horses were not in motion, as was clearly shown by the remains of the horses, and by the fact that there was no movement in the drapery of the statues of Mausolus and Artemisia. On the assumption that the chariot was in motion it had been argued that the figures could not have belonged to the chariot. In support of that view it had also been contended that the figures could not have belonged to the chariot because they were much smaller in scale than the horses. Certainly the horses were very large. But if we were to judge of the scale of the statues in reference to that of the horses, we must not make vague and useless comparisons with the Parthenon frieze, where the proportions of men accompanying horses were out of all scale. There one might see a youth on horseback, and beside him apparently his twin brother on foot; yet the latter, if looked at more closely, and not only in passing as he was meant to be seen (and generally was seen) would be found to be quite a giant in his form and proportions. It was one of the delights of the Parthenon frieze to watch those changes of scale in the human proportions, and to see how they were forced upon the sculptor in order to avoid the realistic effect which would have resulted had he made the youth on foot of the same proportions as his brother on horseback. There was, in fact, only one certain test of scale which the lecturer could see for the Mausoleum group, and that was to measure the head of Mausolus against the head of the horse. The head of Mausolus was 15 in. in height, that of the horse 41 in. The head of the Theseus, in the Parthenon, was 12 in. high, the head of the horse 31½ in. high. The head of an average man measured about 9 in., and the head of the average horse about 24 in. The result was that while the head of the Theseus was a little too large for the horse—as would be expected from his being nearer the centre of the pediment, the head of Mausolus was nearly, to the same extent, too small; but it must be remembered that the horses in Asia Minor were of a larger breed than those of Greece proper. It should also be remembered that the two statues of Mausolus and Artemisia were found in a separate heap of ruins along with the horses and a large number of the steps of the pyramid piled one on another. That particular heap of ruins, says Sir Charles Newton, "had evidently never been disturbed since they first fell from the building;" he adds, "it is evident that an earthquake or equivalent force must have rent asunder the pyramid, hurling a portion of the chariot group, and of the steps on which it rested, over the marble walls." The statue of Mausolus had been put together from more than sixty fragments found in that heap. Now that the remains of the chariot group had been placed together in what appeared to be their original positions the two statues seemed to have gained by being ranged side by side: in attitude one responded to the other in a manner which suggested that they had been composed with that intention. An examination of the detailed treatment of the drapery, &c., showed so close a similarity between the two statues that one was led to conclude that they were carried out by and were the conception of one artist. It had been suggested that the folds of these draperies were too minute and detailed for statues that were to stand at a great height; but surely those were matters on which an artist might be left free to decide for himself. It was all very well to say that minute details of drapery would be lost up at a great height, even in the clear atmosphere of Greece or Asia Minor. If it were asked what could be put in the place of the details, it was easy to reply "a broad and simple treatment;" but would not "a broad and simple treatment" equally suffer from being placed at a great height? The sculptures of the Temple of Zeus, at Olympia, were broad and simple enough, in all conscience, not to say negligent; while those of the Parthenon were exactly in the opposite case. Who, then, should decide when the Greeks themselves did not agree? Then it was argued that in the horses there was a breadth and simplicity which was out of harmony with the statues behind them. But even if that were strictly accurate, it could be defended on good grounds. As a matter of fact, minuteness of detail was not altogether abandoned in the horses. A bronze bridle was found on the head of one of the horses, and the bridle was extremely slight. Being of bronze it might, perhaps, have been visible at some distance when its glitter was new, but that would not last long. It was clearly one of those minor details which the sculptor thought due to his art, whether it could be seen or not. That sculptor, as we knew, was Pythios, one of the architects of the building.

Dr. Murray, in his third and concluding lecture, endeavoured to identify the other sculptures which had survived with the other artists whose names had been associated with the Mausoleum from antiquity to the present day. The four sculptors who were employed, each on a separate side of the Mausoleum, were Scopas, Bryaxis, Leochares, and Timotheos. Of these, the name that had come down to us with the most reputation was that of Scopas. The three others survived him a considerable period, and in the natural order of things, we might conclude that they had joined him at Halicarnassus as comparatively young men, possibly his pupils. It was a little surprising to find Pliny describing them as rivals of Scopas. Each of them worked on a different side of the building, and it was of interest to try and discover whether the undoubted differences of style which were to be seen among the remains of the Mausoleum answered to what was ascertainable about the several artists. The lecturer confined his attention for the most part to the sculptured friezes, because they alone presented a continuity of subject which could be supposed to stretch round the four sides of the building. There were reasons for supposing that the Amazon frieze, which Sir Charles Newton, at the time of its discovery, was inclined to attribute to Scopas, was not wholly his work, or if it was all his, he was not seen at his best in it. The chariot frieze, which had been interpreted as representing the races which are supposed to have been held at the funeral of Mausolus, was very probably by Scopas. With regard to Bryaxis, ancient writers told us of a number of his works, but these did not include a monument in Athens, which had lately been discovered there in the course of excavations necessary for a public improvement. The monument in question consisted of a square pedestal on which had stood a pillar, surmounted probably by a tripod. On the front of the pedestal was an inscription stating that the sculptor of the monument had been Bryaxis. On each of the three other sides there was, in relief, a mounted horseman with a tripod beside him to indicate a prize which he had obtained for having discharged the functions of a *phylarch*, as the inscription also testified. These three horsemen were a father and two sons, who in their day had taught the Athenian youth to ride well and gracefully in public processions, as at the Panathenaic festival. They were thus the successors of the men who had trained those youths whom we saw riding in the Parthenon frieze. Up to now we had no means of judging of these newly-discovered Bryaxis reliefs, and whether they would enable us to

assign to him any definite part of the existing Mausoleum sculptures; but it was stated that the horsemen recall the mounted Amazons of the Mausoleum frieze. There was reason for thinking that he was probably a pupil of Scopas, and that on the Mausoleum he had followed his master's manner so closely that it would be difficult to distinguish between them, even if we had assured specimens from the hands of both before us. Of Leochares so little was known that it was impossible to gather any definite idea of his style. There remained only Timotheos, concerning whom certain facts had been obtained of late years as to his part in the sculpture of a temple at Epidauros. If something of his style could be learned from the ruins of that temple, we were bound to consider whether that same style could be traced on the Mausoleum. In an inscription found at Epidauros he was mentioned as the sculptor of the acroteria of one of the pediments, and of certain reliefs appertaining to the Temple of Asklepios there. Amongst the sculptures found in the ruins of the temple were three Victories, a mounted Amazon, and a Nereid (as it would seem) sitting sideways on a horse. The three Victories, it had been ascertained, belonged to the acroteria of the pediments, and we might therefore claim one at least of them as the work of Timotheos. With regard to the Nereid, there was a probability that it was also by him, seeing that it had orginally stood on one of the lower angles of the west pediment. The mounted Amazon was in a different case, because, if the the current opinion was right, that figure was part of a large composition within the west pediment, and because another artist than Timotheos was assigned in the inscription to that composition. Nevertheless it seemed hardly possible to distinguish, in point of style, between the Amazon, the Nereid, and the Victory. That being so, and one of them assuredly the work of Timotheos, we might not unfairly choose for comparison with the Mausoleum frieze whichever suited us best, and that was the Amazon, on account of the striking similarity of subject. The drapery, with its thin material broken up into slight folds with flat surfaces and sharp edges, presented the same effect as the work in the Mausoleum, and there were other resemblances, though there was a marked difference in the way of sitting the horse between the Amazon of Epidauros and the Scopas slabs of the Mausoleum. In conclusion, the lecturer touched upon a number of other interesting points incidentally arising out of his subject.

COMPETITIONS.

NENAGH CHURCH.—Competition designs were invited for this church from four architects, of whom two responded, sending in designs both of which received high commendation from Mr. Thos. Drew, the assessor, who eventually selected the one which was found to be by Mr. Walter Doolin, of Dublin, who will carry out the work. A premium of fifty guineas was given to Mr. G. C. Ashlin, R.H.A., the author of the other design. 20,000*l.* is to be expended on the building.

COUNTY COUNCIL OFFICES, WAKEFIELD.—The result of the competition for County Council Offices for the West Riding of Yorkshire has just been made known as follows:—First place, Messrs. Gibson & Russell, London; second, Messrs. Cooksey & Cox, London; third, Messrs. Simpson & Richardson, Wakefield.

THE LONDON GEOLOGICAL FIELD CLASS will commence their Saturday afternoon summer excursions on the 29th inst. They are conducted by Professor H. G. Seeley, F.R.S.

THE INCORPORATED ASSOCIATION OF MUNICIPAL AND COUNTY ENGINEERS.—The fifteenth voluntary pass examination of candidates for the offices of Municipal Engineer and Local Board Surveyor, carried out under the auspices of this association, was held at the Institution of Civil Engineers, Great George-street, Westminster, on Friday and Saturday, April 7 and 8. The whole of the first day was occupied in the written portion of the examination, while the *viva voce* took up the greater part of the second day. Nineteen candidates entered for the examination. The examiners were—1. Municipal Engineering, H. P. Boulnois, M.Inst.C.E. (Past President); 2. Building Construction, J. Lobley, M.Inst.C.E. (Past President); 3. Sanitary Science, A. M. Fowler, M.Inst.C.E.; 4. Public Health and Rivers Pollution Acts, C. Jones, M.Inst.C.E. (Past President). The next examination will be held at Liverpool in October next.

ARCHITECTURAL SOCIETIES.

EDINBURGH ARCHITECTURAL ASSOCIATION.—On Saturday, April 8, the Edinburgh Architectural Association visited Whitekirk, Prestonkirk, and Tyninghame, in East Lothian, under the leadership of Mr. Hippolyte J. Blanc, A.R.S.A. Favoured by excellent weather, this, the fourth visit of the current session, was well attended. East Lothian is proverbial for its fertility and finely-timbered stretches of fair scenery, in the midst of which are some of the most interesting architectural remains in Scotland. Prestonkirk, first visited, dates its ecclesiastical history from the time of the Culdees, its site being one of a series of missionary stations planted in the East of Scotland. The most interesting part of the existing church is the chancel, an excellent example of Early English work. The three well-proportioned double-splayed lancet windows of the east end are all of equal height, separated from each other by chamfered buttresses. The angles are flanked by double buttresses; a splayed base-course, of unusual projection, receives the buttresses, which are bold and good, but now overgrown by dense ivy. Lancet windows light the chancel both to north and south; to the north, however, they are partially blocked up, the chancel being divided into a tomb for the Smeaton family below, and a room, approached by an outside stair, above. A door of Perpendicular detail now forms an entrance to the tomb. The interior of this interesting portion of the church, unfortunately, could not be examined; the nave is devoid of interest, having most unhappily been "rebuilt" by the local mason early in the present century, a "rebuilding" which, to judge from a fine groining boss and other rich fragments now lying in the "manse" garden adjacent must have entailed havoc and destruction much to be deplored. The tower at the west end is of much later date than the church, and more civic than ecclesiastical in feeling, with round-headed windows and ogival roof; it is a good specimen of a type common in the East of Scotland. Whitekirk, next visited, lies about eight miles due north-east of Prestonkirk; it also owes its origin to Culdee influence, its foundation being ascribed to a holy well (now disappeared) of miraculous healing properties. So famous was the spot that in 1413 some 15,000 pilgrims are said to have visited it. A tithe-barn still stands to the north of the church as evidence of former wealth. The church is cruciform in plan; the eastern portion belongs to the year 1439, the prosperous period of the church. Though without the grace of Prestonkirk, it is exceedingly interesting, and in one respect unique. The east-end rises to the eaves-level an unbroken mass of masonry, without buttress or window; at the eaves-level it is weathered back, with crow-stepped gable-sides, and in the triangle thus formed is inserted a circular window with quatrefoil tracery, probably inserted later. On the north and south, massive buttresses of unusual breadth sustain the roof, which is a pointed barrel vault without ribs of any kind. Over the crossing is a tower, not quite square in plan, with a projecting parapet carried on corbels, but rounded off above the square angles of the tower itself; the roof is a straight-sided pyramid, slated. The belfry stage, now used as a pigeon-loft, is lit by pointed double lights rather crudely treated, below which are square openings into the originally much steeper roof. The north transept is old, and contains the Haddington pew; the south transept is modern, by Dr. R. Rowand Anderson, and affords accommodation for organ and choir, which, in Presbyterian ritual, do not occupy the chancel. The nave, which was built after the eastern portion, does not offer any special interest architecturally; but a very good fourteenth-century porch, with angle buttresses, has been thrown forward to the south, not structurally connected with the main building, in front of the square-headed south door. This porch, which is sadly decayed, is again a pointed barrel vault, but has ribs applied to it, as may be seen in St. Giles's Cathedral, Edinburgh, and elsewhere in Scotland; the practice would seem to indicate a certain want of skill or frankness in treating Gothic roofing. Two points of considerable antiquarian interest are to be noted in Whitekirk Church. On the south-west pier of the crossing arches, facing eastward, is a singular recess, about 18 in. square, and rebated on the face, as for a door. This, it has been suggested, was a "leper-window," an explanation, however, that suggests a difficulty, in that it would have been better placed in the transept wall adjoining than in the pier. Further, immediately above the south door, are two small lozenge-shaped openings, now built up; and two similar apertures, some 12 in. square (also built up), can be made out on either side of a niche long since defaced, above the entrance to the porch. These are commonly supposed to have contained lamps, as the niche would doubtless contain a statue of the Virgin, the church being dedicated to St. Mary. An explanation, however, perhaps more satisfactory is that the pier recess contained some relic or treasure of the church, which was exhibited to the pilgrims at festival times on a sort of scaffold or wooden structure over the entrance doorway; the small built-up holes referred to would thus be sockets for the wooden scaffold, the inner ones being built up when the porch was added. Tyninghame House, the seat of the Earl of Haddington, was subsequently visited, the Association being most kindly received and conducted over it by the noble owner. The building, which was extensively added to about 1824 in the pseudo-Elizabethan style, is chiefly interesting for its wonderful situation in the famous Tyninghame Woods, commanding very lovely views of the Tyne, and even of the sea. It contains a rare collection of art treasures in portraiture, including examples of Vandyck, Reynolds, Jamesone, and Raeburn. Of great interest to the ecclesiologist are the two sets of pewter communion-flagons from Whitekirk and Prestonkirk, one dated 1708; a pair of old collection plates; and a handbell of 1665, formerly used in the parish for funerals. Within the grounds are the ruins of Tyninghame Priory, a Norman building of great richness, closely resembling the churches of Leuchars and Dalmeny. Two wall shafts remaining *in situ* show that the choir was apsidal; two very rich Norman arches also remain, occupying a similar position to those still existing at Dalmeny. The south shafts of the eastern arch are deeply scored, owing to an ancient practice of men of arms on the eve of battle thus invoking a blessing on their weapons. Considerable remains of the old Norman work, including many interesting fragments, are still to be traced, built into the Tyninghame stables.

GLASGOW INSTITUTE OF ARCHITECTS.—At the last quarterly general meeting of the Glasgow Institute of Architects, the President, Mr. W. Forrest Salmon, brought up the following recommendation from the Council of the Institute regarding the proposed by-laws under the Building Regulations Act, 1892, viz., that the Institute withdraw its opposition to the by-laws on the understanding that by-law No. 73 would be struck out, and that it was the intention of the Town Council to prepare in a year or two a Building Act for Glasgow more thorough in character than the existing Acts, and to consult with the Institute when framing the clauses. On the motion of the President, the Institute adopted the recommendation.

GLASGOW ARCHITECTURAL ASSOCIATION.—The usual monthly meeting of this Association was held in the Rooms, 114, West Campbell-street, on the 4th inst., Mr. A. N. Paterson, vice-President, in the chair. Mr. A. M'Gibbon, President, read a paper entitled "Some Minor Practical Building Details." Reference was made to many different points of construction in connexion with masonry, carpentry and joinery, iron work, &c. The paper was illustrated by diagrams, and at the close a hearty vote of thanks was awarded the lecturer.

THE MEMBERS' SOIRÉE, ARCHITECTURAL ASSOCIATION, has, we learn from *A. A. Notes*, been unavoidably postponed from April 14 to Wednesday, May 17.

INSTITUTION OF MECHANICAL ENGINEERS.—An ordinary general meeting of this institution will be held on Thursday evening next, April 20, and Friday evening, April 21, at 25, Great George-street, Westminster, by kind permission of the Council of the Institution of Civil Engineers. The chair will be taken at 7.30 p.m. on each evening, by the President, Dr. William Anderson, F.R.S. Among the papers to be read and discussed will be one "On the Second Report to the Alloys Research Committee," by Professor W. C. Roberts-Austen, C.B., F.R.S. In connexion with this subject, Mr. William Dean, Locomotive Superintendent of the Great Western Railway, will read a paper on "Tensile Tests and Chemical Analyses of Copper Plates from Fire-boxes of Locomotives on the Great Western Railway."

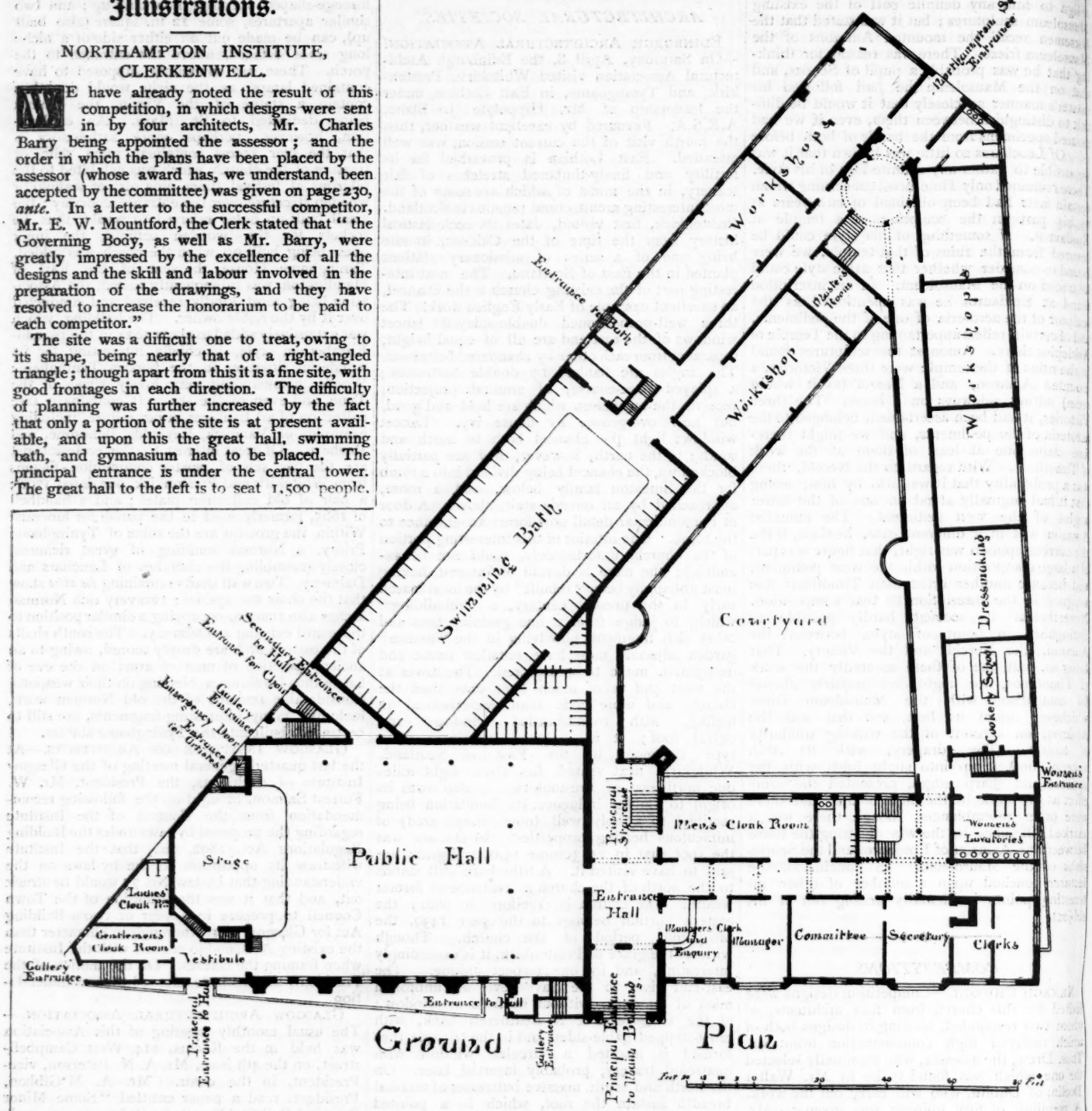
THE ENGLISH IRON TRADE.—Little alteration has taken place in the English iron market during the week. In crude iron matters generally remain quiet, and manufactured iron is still depressed. Tinplates, however, are fairly active. In steel little is doing, and in the North-west makers have reduced heavy rails 5s. per ton. Shipbuilders and engineers continue indifferently employed. The coal trade is quiet.—*Iron.*

Illustrations.

NORTHAMPTON INSTITUTE, CLERKENWELL.

WE have already noted the result of this competition, in which designs were sent in by four architects, Mr. Charles Barry being appointed the assessor; and the order in which the plans have been placed by the assessor (whose award has, we understand, been accepted by the committee) was given on page 230, *ante*. In a letter to the successful competitor, Mr. E. W. Mountford, the Clerk stated that "the Governing Body, as well as Mr. Barry, were greatly impressed by the excellence of all the designs and the skill and labour involved in the preparation of the drawings, and they have resolved to increase the honorarium to be paid to each competitor."

The site was a difficult one to treat, owing to its shape, being nearly that of a right-angled triangle; though apart from this it is a fine site, with good frontages in each direction. The difficulty of planning was further increased by the fact that only a portion of the site is at present available, and upon this the great hall, swimming bath, and gymnasium had to be placed. The principal entrance is under the central tower. The great hall to the left is to seat 1,500 people.



The Northampton Institute, Clerkenwell.—Plan of Selected Design.

in addition to an orchestra of 200 performers, with all necessary retiring-rooms, &c. There are three entrances to the ground floor of the hall, and three separate staircases leading to the gallery, besides the entrances for choir and artistes. The swimming bath has a separate entrance, and measures some 120 ft. by 60 ft., the gymnasium being about the same size.

Social-rooms, refreshment-rooms, cloak-rooms, and lavatories, are provided for each sex, while there is a large reading-room, library, and museum &c., common to both. Workshops, laboratories and class-rooms are also provided. The administrative-rooms are arranged on the ground floor adjoining the principle entrance.

The committee have limited the cost to 50,000*l.*, with a margin of 10 per cent.

The site has been given by the Marquis of Northampton, and the buildings are intended to serve as the Central or City Polytechnic, the site being not very far north of the City boundary.

THE IMPERIAL LAW COURTS, TOKIO.

As is well known, Japan has of late years shown a great tendency to Europeanise all her institutions, and although this Europeanising tendency fluctuates very much according to the changes in political parties, it is on the whole progressive. As the new constitution of Japan has been organised on European models, it is not unnatural that European assistance should have been sought for in designing the new public buildings. That the Japanese should have gone to Germany instead of to France or England for their architects is probably due to some previous relations between the Governments of the two countries.

Messrs. Ende & Boeckmann, the architects selected, have had no very easy task, having been driven this way and that way in turns, according as the patriotic or progressive party in Japan were predominant, towards a Japanese, a semi-Japanese, or a European style of building. Of the two designs shown here, one is an example of an attempt to combine a certain amount of Japanese character with some of the features of European Renaissance, and as the experiment is of some interest and cleverly carried out we have thought it worth while to give an illustration of it. This design had been approved and actually commenced, when a European fit took the Japanese again and the work was countermanded in favour of a more distinctly European design. This is here shown, nearly as it is now being carried out.

This is only one of five great buildings designed by Messrs. Ende & Boeckmann for the Japanese Government, the others being the Houses of Parliament, the Admiralty, the Ministry of Justice, and the Police Headquarters. These are all in process of execution, but the Law Courts, the one which we illustrate, is the most advanced. It will contain the courts of each of the three degrees of judicial appeal recognised in the legal system of Japan. There is a fine central *Salle de pas perdus*, with a large main staircase leading to the Superior Courts on the first floor. A library and reading-room form a portion of the plan. The small plan given in the corner of the Renaissance design (we regret that the architects have not furnished us with a larger and more detailed one) applies to both of the designs, the alterations referring only to the external architectural treatment.

Herr Hartung, the senior assistant to Messrs. Ende & Boeckmann, is mainly responsible for the design of this building, which has been carried out under the superintendence of Herr Seel, the senior clerk of works in Japan. Both the senior partners of the firm, however, have in turn taken up residence at Tokio for a time to look after the work, for which they have had to train the workmen specially, as well as superintend the preparation of materials by opening quarries and founding brick-kilns.

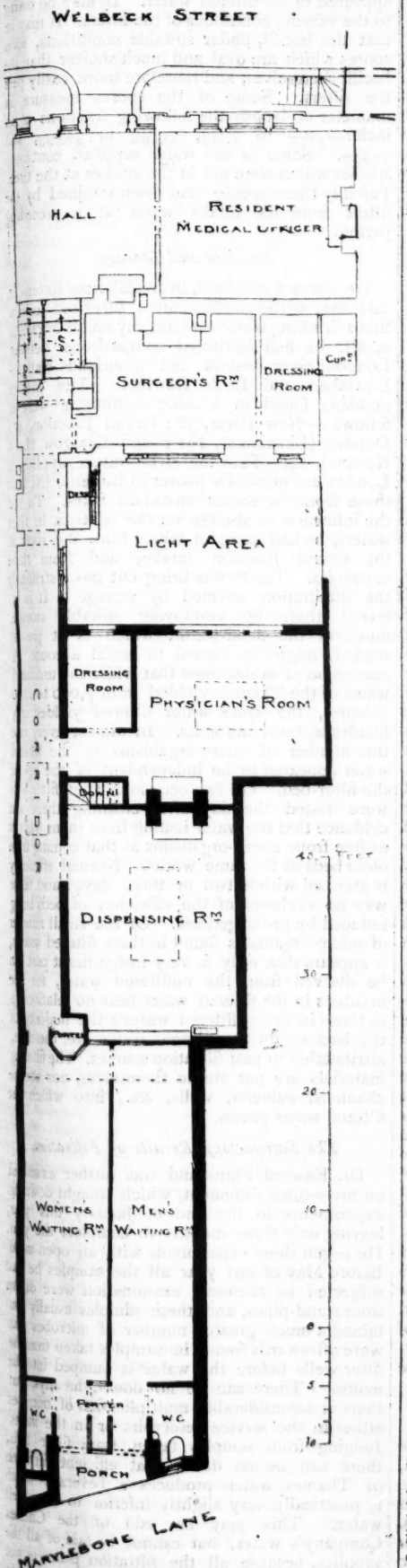
PARISH ROOM AND SCHOOL, ALL SAINTS, PLYMOUTH.

WE had not received any description of this building up to the time of going to press. The drawing was exhibited in the last Royal Academy Exhibition. As we said of it at that time, the architect,

Mr. Edmund Sedding, seems to have caught something of the feeling of his late talented brother in the treatment of the staircase which leads to the upper floor, with porch over the top landing (shown in the view).

ST. MARYLEBONE GENERAL DISPENSARY.

THE drawing represents the Marylebone-lane front of this building, which extends from Marylebone-lane to Welbeck-street. The patients' waiting rooms, the dispensing room, with laboratory under, and the physician's consulting-room, with dressing room attached, are in this portion of the building, and the corridor is continued into



the Welbeck-street block, where the surgeon's consulting room, with its dressing room, is placed. The portion of the building illustrated was erected in 1891 by Mr. John Hooper, builder, Herne-hill, the contract being about 1,200*l.* The Welbeck-street block, containing the board room and resident medical officer's rooms, has been subsequently added. Mr. Beresford Pite is the architect.

THE ROYAL COMMISSION ON METROPOLITAN WATER SUPPLY.*

WE have held over our summaries of some of the evidence taken at the last sittings of the Commission, having, however, indicated that analyses carried on down to the latest moment had materially changed the views of experts as to the efficacy of storage and filtration in removing objections to the continued use of the river waters. The results of these later experiments and the confident opinions based upon them appear likely to exercise an important influence on the results of the inquiry.

The East Kent Chalk Supplies.

In his examination, Mr. William Whitaker estimated that there was an area to be dealt with of 390 square miles east of the Darent. An inch of rain yielding 15,000,000 gallons, the Commission had to multiply that by any figure they might select between 4 and 15. How much of the rainfall could be secured by the suggested works could be answered only by experiment, but he should say undoubtedly it would be 50 or 60 million gallons a day.

Mr. William Topley thought that on this estimate the amount of percolation was underestimated. He took the area of percolation in the valleys of the Medway, the Swale, and the Stour and St. Margaret's Bay at 467 square miles; he estimated the total percolation at 111½ gallons; and he believed it would be possible to get more than 50 or 60 milllons of this. In order to get all the water there would have to be great work done in driving tunnels and headings miles and miles.

Mr. W. Easton, in a long and exhaustive examination upon the statement we have already summarised, explained a large number of sections designed to illustrate the flow of water through the chalk in the Thames valley. He was with Mr. Topley and Mr. Whitaker between Gravesend and Northfleet, at low water during a neap tide. Walking along the bare chalk they saw reaches of fresh water running out through the fissures in the chalk, just as they are to be seen in the tunnels at Brighton and elsewhere. Then how is it, asked the Chairman, that the Northfleet people have a difficulty in getting water? It is simply that there, as in almost every case in the chalk, the water is running in well-defined channels or fissures, and these fissures generally have no lateral communication whatever. Certain wells at Northfleet are drawing from a certain line of fissures. As a general rule he does not believe in a "cone of depression" in the chalk, certainly not where the water is running in fissures. In many instances water is at varying levels in adjacent fissures. There is a vast amount of water that falls upon the chalk, and is passing away by underground channels—a small amount through the main body of the chalk, and most of it through fissures. In driving tunnels there are met with long spaces of dry chalk—200 to 250 ft. with scarcely a drop of water. At another point, Mr. Easton said that besides the water we get in the regular slope of the chalk, there is another underground stream in all probability derived from that uncovered chalk without streams in the upper part of all these chalk areas, which never feeds the upper springs at all, but which always runs down underneath the ground and gets out somewhere. It is not improbable that it goes straight under London; but that is a very difficult question indeed. He does not think the chalk under London has ever been properly tapped. It has not been tapped, as at Brighton and Ramsgate, with tunnels—there has been no opportunity of doing that. It probably runs away underneath to some outlet at sea-level. According to the estimates of absorbed rainfall there must be an enormous quantity running out somewhere every year.

Mr. Bryan, of the East London Company, having heard Mr. Easton's evidence, and being the next witness, volunteered to give roughly an idea of the slope of the water in the chalk at the company's Lea Bridge well, where they have 7,000 ft. of tunnel. He said they had gone to all the points of the compass without meeting with a big fissure. The water seemed to come in almost equally for every 100 or 200 ft., and none of the bore-holes yielded anything. But at Waltham Abbey, where two fissures had been cut, the yield of the bore-holes was enormous.

Proposed Thames Tidal Reservoir.

Mr. C. Moore, the Engineer to the Conservators, said that if it were thought necessary to take 100,000,000 gallons a day more at Hampton, and if the proposed storage reservoirs in the Upper Thames were deemed impracticable or undesirable, compensation water for the reaches below Richmond might be obtained by turning the Deer Park into a tidal reservoir to hold 50,000,000 gallons, to be filled with the rising tide and discharged at low water. The top water level would be about 2 ft. below Trinity, about 10·50 ordnance datum, and the bottom would be 10 ft. below Trinity, or 2·50 ordnance datum. Sections were exhibited showing how different quantities of water would affect the depth in the river, and the extent of foreshore exposed. The risk of deposit would be reduced by what the County Council are doing to take solid matter out of the sewage. Indeed, the commencement of the rise of the tide is the damming back of the river water. The late spring tides bring the dirty water. They run up two or three feet above Trinity, and the last part of these tides might be kept out of the reservoirs altogether. Little of the lower sewage water need ever be admitted into the reservoir, and there would never be any salt water there.

Mr. Binnie objected to impounding tidal-water, and substituting that for the purer flow of the river. He referred to the state to which the Lea is reduced in its lower reaches by the abstraction of upland waters. If more water is taken from the Thames, a proper amount of compensation water ought to flow down the long reach of the river between Staines and Teddington, a distance of eighteen to twenty miles, and afterwards into the tidal portion of the river below Teddington Weir. In this respect, the proposed upper reservoirs were satisfactory. We wished to have the Thames pure as well as navigable, and tidal water would be detrimental to health. Then a large amount of impurity passes into the river, and it is desirable to have it carried to the sea as rapidly as possible. The downward flow of the whole mass is determined by the volume which comes over Teddington Weir. It was explained to Mr. Binnie that this compensation reservoir had nothing to do with other reservoirs, but it was suggested because Mr. Hawksley, Mr. Martin, and Mr. Moore had agreed that 100 millions more gallons might be taken out of the Thames and leave it as full as before, but with the effect of diminishing its velocity by one-half, and that this tidal reservoir was to supply the 100 millions. This did not remove Mr. Binnie's objection to taking another 100 millions in the height of the summer out of the Thames at Hampton. It would make a "real, perceptible, appreciable difference." Mr. Binnie adhered to his view, although pressed very hard, particularly as to the small proportion borne by the river water to the tidal water.

Proposed Reservoirs in the Lea Valley.

Mr. W. B. Bryan, on behalf of the East London Company, submitted a scheme for enabling the company to take more water from the Lea by increasing the storage from 740,000,000 to 2,000,000,000 gallons, so as to allow a daily abstraction of 40,000,000 gallons in such a period of drought as that from June, 1887, to March, 1888. The filling of the reservoir would take for a time all the water passing over Field's Weir; but there would be two compensation reservoirs filled with flood water to supply the navigation. The new reservoirs would be from 20 ft. to 30 ft. deep, and the compensation reservoirs 17 ft. deep. It was all marsh land, and there was not a house upon the areas, the greater part of which was subject to floods. These new reservoirs were to be filled by a new cut to take the water from the Lea down to Waltham Abbey, close to the company's station Waltham Abbey well. The whole area of the proposed reservoirs is upon the London clay, the depth of which, from the surface-level, is from 10 ft. to 18 ft. Puddle trenches would be constructed, and the reservoirs embanked to the top of the water-level. The river Lea would be left as a flood channel in flood times, the flow of the river being sometimes 1,000 million gallons a day. From February to November the average flow was 82,000,000 gallons, and it would be quite right to take three-fourths of the whole flow,

* For previous reports of the evidence given before this Commission, see the last two volumes of the *Builder*, as per references given in footnote on page 518 of the number for December 31, 1892; see also current volume, pp. 93, 131, 151, *ante*.

because the appearance of the stream would not be affected, and the navigation was canalised. There had been no complaint of the condition of the river since the Tottenham sewage was taken out of it.

Mr. Binnie objected that the proposed reservoirs would be expensive, and, situated in the water-bearing gravel, would be difficult of construction. They would be shallow, and the depth of 20 ft. would be practically less in hot weather. This would not be conducive to purity, especially with flood water from a populated and cultivated area. If more water can be had from the Lea, how is it the East London Company have resorted to the Thames? Their late Engineer said as much had been done as was possible in the way of storage in the Lea Valley. It is already on record that the two companies, the New River and the East London, take all the flow of the Lea in dry weather. To pump 44,000,000 gallons from the chalk in the valley would dry up the chalk springs which feed the Lea.

Conflicting Analyses.

Mr. Richard Bodmer, Public Analyst for St. Saviour's, Southwark, and Bermondsey, produced the results of analyses of samples of water taken from cab-rank stand-pipes in Southwark-street and Blackfriars-road, the analyses being unfavourable to the Southwark and Vauxhall in one case and the Lambeth in the other. The tests were—the albuminoid ammonia, Wanklyn's standard, and oxygen required to oxidise organic matter, Tidy's standard; and he concluded that the waters were not fit for a public supply. Examined by Professor Dewar, he said he had not determined the organic carbon, or the organic nitrogen; and he admitted that the results of Dr. Frankland of the same date were totally opposed to his own; but the difference depended not only upon the standards taken, but also upon the samples. Dr. Frankland and others used the organic carbon, and the organic nitrogen methods, and therefore their results were not directly comparable with his; and unless the samples were identical, it was unfair to compare analyses. The Chairman wanted to know whether a cab-rank stand-pipe was at the dead-end of a pipe, or on the centre of a main, but the witness did not know; only water is being continually drawn from a stand-pipe, and therefore it is considered to be the fairest spot for taking a sample from. When the companies have known that samples were going to be taken, they have drawn off water by the firecocks so as to renew the water at the stand-pipe from the main; but it would take some hours to renew the water in the mains from a filtered supply in a reservoir.

Conclusions of the County Council's Chemist.

Mr. W. J. Dibdin, who had in July handed in a series of analyses of the water of the Thames and the Lea taken at the companies' intakes, and also of the filtered waters supplied to the Metropolis, said that these analyses had been continued so as to cover fourteen months. The results were embodied in tables and plotted on diagrams. They showed that, although the waters at the intakes had returned to a condition similar to that during the storm period of October and November, 1891, the filtered water supplied by the companies had in no case been as impure as it was at that time. In October and November, 1891, the weekly rainfall rose to 1·3 and 1·5 inches, while in the corresponding months in 1892 it rose to 1·5 and 1·8 inches. During the former period the organic elements in the filtered supplies ranged from 0·2 to 0·64 parts per 100,000, while during the latter period they were 0·06 to 0·15 parts per 100,000. The albuminoid ammonia in like manner fell from about 0·012 to about 0·006; and the oxygen absorbed from permanganate in four hours fell from about 0·13 grains to 0·08 grains per gallon, while the colour of the water fell from 3·5 to 1·2. The continued examination of the waters of the rivers had shown that these large reductions are not due to any specified improvement in the unfiltered supplies, which is evidence that the companies have found themselves better able than formerly to deal with flood-waters—a result presumably brought about by the attention called to the matter, which strongly points to the advantage to be derived from a systematic examination of the water.

In examination on this statement, Mr. Dibdin said that, taking the various analytical factors—the organic elements, the albuminoid ammonia, the oxygen absorbed by the organic matter in the water, and the colour of the water—they confirm one another. During the last storm period the water at the intakes had been worse than before, while the water delivered had been of a better quality. The discharge of the Emms Ditch into the Windrush had been roughly from three to sixteen times the strength of ordinary London sewage; and all that was washed into the Thames. While the unfiltered water had been actually worse than it was in October and November, 1891, the filtered water had been much better. Something wrong had been pointed out in an impartial manner, and the companies had done their best to put it right. He saw no reason why the standard that had been reached should not be maintained, and indeed he saw reason why it should be improved upon. The improvement in organic elements had been effected with a worse natural water and the filtered water had been 33 per cent. better. In the case of the albuminoid ammonia the improvement was as much as 50 per cent. With the flood water impounded and treated as it now is, it was not objectionable on the score of health, but there was a strong sentimental objection to drinking the sewage of the population in the Valley of the Thames, coming down in many cases as untreated sewage. There was no evidence that the water as it had been supplied during the last six months could be suspected of producing diseases. For anything shown to the contrary, the waters were perfectly pure and wholesome. The companies that had improved were the West Middlesex, the Chelsea, the East London, the Southwark and Vauxhall, and the Lambeth, and, after some delay, the New River. If there were regular inspection in the water-shed of the Thames and a large increase of storage the improvement effected might be permanently maintained. The question of pollution must be carefully considered in connection with storage. In the Emms ditch, which discharges into the Windrush near Witney, there is abundant evidence of pollution with strong sewage. If water is to be collected from the drainage areas suggested, the most stringent measures must be adopted to prevent pollution. It was also important that the method of conveying the water from reservoirs to the Thames should have careful consideration. If the reservoirs emptied themselves into streams flowing to the main river, they would merely act as carriers of the pollution of the towns on their route. The consequence of this would be even more objectionable than the present system, because the fresh sewage would be carried direct to the river, thus allowing less time for oxidation, &c. As a further precaution, before the water is admitted into the storage reservoirs, it should receive a rough filtration through gravel beds in order to prevent the admission of particles of polluting matter. The whole district supplying a reservoir should be under the most strict observation. It was not desirable that a question affecting the health of the inhabitants of London should be entrusted to a supervision which had been found wanting. Apart from all biological considerations, the admission of crude sewage into drinking water must be objectionable, and it should be prevented by means of proper restrictions imposed by an authority having power to enforce its regulations. He had, in previous evidence, shown that there was gross pollution of tributaries by sewage. He submitted that there was not the slightest reason why it should be continued, and, if it were proposed to have storage reservoirs, it was imperative that the utmost precautions should be taken to prevent that sewage pollution. In reply to Professor Dewar, Mr. Dibdin said there was not, and three was not likely to be any large concentration of manufacturing industries in the valley of the Thames. It was substantially an agricultural area, and therefore favourable for the collection of of water. Even with gross sewerage pollution, analyses showed that the water as delivered was wholesome and pure. The longer flood waters were impounded in suitable reservoirs, the safer they would become. While there were localised areas that were exceedingly bad, like the valley of the Windrush, the flood water of the whole water-shed was not in such a state of impurity that we need be frightened at its being used.

Bacteria and Filtration.

Dr. Klein carried on an examination into the character of the microbes, notably the bacteria, occurring in the intakes of the companies and in the water distributed by them. Ten samples were supplied to him once a week for six weeks. In a good many instances the colonies or their sub-cultures were tested on animals in order to ascertain whether they possess pathogenic action. In no case did he come across any of the known pathogenic bacterial species, or any of the species that produce on the animals experimented upon—guinea-pigs, mice, and rabbits—definite pathogenic action. Of course, searching for an individual bacterium was no less difficult than looking for a needle in a bundle of hay. So the examinations do not prove that the bacteria sought for were not present, or that, although then absent, they might not be present in any of the other forty-six weeks of the year. Some spore-bearing bacilli, as well as non-spore-bearing and micrococci, present in the intake water, are not removed by the filters. B. mesintericus and fluorescens were present in the intake waters of both the Thames and the Lea. While on one occasion the filters of one company or another were capable of intercepting them, at another time they did not, and one or both appeared in the filtered water. It may be owing to the varying conditions of the filters. It may be that the bacilli, under suitable conditions, form spores which are oval and much shorter than the bacilli themselves, and therefore more easily pass the filters. Some of the spores measure in diameter or length the following fractions of an inch:—$\frac{1}{2500}$ to $\frac{1}{8000}$, $\frac{1}{25000}$ to $\frac{1}{30000}$, and $\frac{1}{50000}$. Some of the water supplied contained species which were not in the intakes at the time. Possibly these species had been retained by the filters from the intake water at a preceding period.

Bacteria and Storage.

Dr. Percy Frankland, in an elaborate statement, said that as the public is often surprised to learn that a drinking water contains any micro-organisms at all, he had instituted comparisons between London river waters and moorland waters—Lintrahen and Loch Katrine. The average numbers found in a cubic centimetre were as follows:—New River, 38; Grand Junction, 47; Dundee (Lintrahen), 161; and Glasgow (Loch Katrine), 74. Thus the river waters supplied in London are markedly poorer in bacterial life than those from the Scotch mountain lakes. To test the influence of storage on the bacteria in river waters, he had samples taken from the river at the Grand Junction intake, and from three reservoirs. The results bring out most strikingly the diminution effected by storage. It is inferred that, by employing suitable storage, much of the flood-water, which is at present wasted, might be turned to useful account. A succession of tables show that while the unfiltered water of the Thames yielded from 7,000 to 1,000 colonies, the same water filtered yielded only hundreds, tens, and units. In almost every case the number of micro-organisms in the filtered water appeared to be independent of the age of the filter-bed. On two occasions when filter-beds were tested the day after cleaning there was evidence that the water issuing from them was not as free from micro-organisms as that coming from older beds at the same works. Normal efficiency is attained within two or three days; and there was no evidence of the efficiency of beds being reduced by prolonged use. Of the small number of micro-organisms found in these filtered waters, it appears that only a very insignificant part can be derived from the unfiltered water, for the numbers in the filtered water bear no relationship to those in the unfiltered water; the majority of the bacteria in the filtered water are, therefore, attributable to past filtration sources. The filtering materials are not sterile themselves, nor are the channels, culverts, wells, &c., into which the filtered water passes.

The Satisfactory Results of Filtration.

Dr. Edward Frankland was further examined on his second statement, which brought down his experiments to the end of January this year, leaving only three months to complete the year. He began those experiments with an open mind. Before May of last year all the samples he had subjected to chemical examination were drawn from stand-pipes, and these samples usually contained a much greater number of microbes than were afterwards found in samples taken from the filter wells before the water is pumped into the mains. There can be no doubt, he says, that there is a considerable multiplication of microbes either in the service reservoirs or in the mains Judging from samples taken from filter-beds, there can be no doubt that efficient filtration of Thames water produces a beverage which is practically very slightly inferior to deep-well water. This may be said of the Chelsea Company's water, but cannot be said of all the supplies, because all the filtration plant is not equally efficient. Double filtration in certain cases would be very desirable; it would have enabled the Southwark Company to avoid instances of great microbial impurity. They knew

they were using their filters in a way they ought not to be used, but they could not avoid it; they had to send out a certain quantity of water, and they had not sufficient filtering area whilst one filter was being repaired. Occasional double filtration is desirable, and that it is not impracticable is shown by the fact that the Grand Junction Company is carrying it out upon a considerable scale. The lower the temperature of river waters the more microbes or spores they contain. The seldomer filters are cleaned the better, if only water will go through. The companies that with equal storage capacity employ the thickest stratum of sand put into their mains water containing the smallest number of microbes. You may have chemical purity with bacterial impurity; and greater bacterial purity would result from storage before filtration. Storage capacity is an important factor and slowness of filtration another. There ought to be sufficient storage to prevent the use of flood water, which is the probable cause of every "bad" report. One of the chief agents in efficient filtration is "a coating of something or other on the surface of the filter, which arrests microbes from getting into the sand at all." With a perfectly purified sand there would be no efficient chemical purification, and probably no bacterial purification. When filters are working efficiently a single filtration is sufficient, and it is always sufficient for gravel waters as distinguished from raw river water. For the first day or two after the sand has been cleaned the water should be passed through a second filter. It is the cleaning of the sand which is dangerous, and the longer a filter is in use the more efficient it seems to become. Stopping up is due to the deposit of mineral and dead matter as well as the growth of the skin. The recent immunity of Altona from cholera during its prevalence in Hamburg was a very severe test of the practical efficiency of the filtration of water; and if efficient filtration is carried out in London, we shall have no epidemic of cholera. If filtered water remain in the mains 12 or 14 hours at a temperature of from 45 to 65, the microbes would multiply perhaps a hundredfold. But by reducing the number to a minimum you reduce the chance of any of them being pathogenic. If they are only non-pathogenic it does not matter how much they multiply. Experiments seem to show that pathogenic organisms will not increase in equal ratio; and if they were one to nine the pathogenic would not have much chance of continuing life. A pathogenic organism naturally develops in the body of an animal and not in water. Some will develop in water; typhoid organisms, for instance, will develope in water which has been artificially freed from other microbes; but if other microbes are present they seem to be eaten up by them and to disappear. The survival of the fittest in water is the survival of things which are not objectionable. There is in the Thames basin an excellent supply of water for the next hundred years at least. To increase the supply adits ought to be driven into the chalk and oolite formations, so as to deplete them of their water in wet seasons and leave room for the storage of fresh rainfall.

Mr. Binnie reiterated his objection to taking a supply in perpetuity from the open rivers, on account of the polluted nature of the flood-waters, which would get worse with increase of population. He added that looking to the cholera outbreak at Valencia, in Spain, where the water was filtered, to the case of Stockton and Middlesbrough, reported upon by Dr. Barry, and to his own experience in India, he did not believe that protection was to be obtained by mere sand filtration. As to Spain, the County Council had intended to adduce the evidence of the late Mr. Higgins, but his death prevented that. As to Stockton and Middlesbrough, the chairman told Mr. Binnie they could not consider the case until they had the completed as well as the interim report. At Nagpore, Mr. Binnie said he had himself seen impure water filtered through considerable thickness of sand drank by the people and causing cholera. It was filtered, and it was as clear to the eyes as London water. It was not a public waterworks with regular filtration; but there was a tank, and people passed water from it through sand by digging holes in the adjoining sand. The tank itself was not cleaned out. Cholera was got rid of by bringing a new supply from the hills and distributing it without filtration. The old tank was half a mile long, a quarter of a mile broad, and 20 ft. deep. The Chairman and Dr. Ogle both intimated that the official report on the Nagpore case did not say anything about sand filtration, that no inference could be drawn from the case supporting Mr. Binnie's statement, and that the prevalence of cholera and the state of the water were wholy different from any conditions that could exist in the Thames valley. Mr. Binnie did not say that sand filtration was of no use; but it did no more than clear water from visible impurities. The Commission had been told that no chemical analysis would detect in water those dangerous properties which communicate disease. Asked "Do you know anything better than sand filtration?" he replied, "I do," and added, it was to obtain a water free from objection, as Manchester, Liverpool, &c., had done.

Mr. Binnie's Last Words.

We have given under other headings Mr. Binnie's criticisms of the proposals mentioned. He further said the estimate of the cost of the proposed reservoirs at Staines was very low, and a large filtering area would be required for the additional supply of 200,000,000 gallons a day. The estimate of 5,391,435*l.* contained no item for filter-beds, or the distribution of the water when filtered. It is proposed to reduce the flow of the Thames to a minimum below which it has fallen only on thirty-one days during the last nine years. What occurred in those dry years is matter of notoriety. The river above London was so dry that people could walk across it, and its condition in the neighbourhood of London was most unpleasant. The assumption that 135,000,000 gallons a day can be obtained from the Lea Valley and the Chalk Wells of Kent ought not to be assented to, because it is clear that the dry weather flow of the Thames and the Lea is entirely dependant upon the chalk springs. Citing returns of the monthly flow of the Thames at Teddington in 1884-5-6-7-9, 1890-1, and the fact that on 236 days of 1891 the river waters were abnormally coloured and turbid, Mr. Binnie contends that the companies must either take the flood water or abstract the clear dry weather flow of the river, or provide even more than sixty days' storage.

Evidence of the Water Examiner.

The last witness was Major-General Scott, Water Examiner under the Metropolis Water Act, 1871, who described his duties and his manner of carrying them out. Speaking of sewage farms, he said it was objectionable that they were leased to private individuals, who sought to make profit, whilst there were many times when all questions of profit must be disregarded. They required to be managed with more scientific knowledge than was often possessed by the persons left in charge of them. In the upper part of the Thames there ought not to be any difficulty in finding sites for sewage farms. He had compiled from the monthly returns the following table, showing the works possessed by each company for the purification of the raw river water:—

	Subsidence Reservoirs.		Filters.	
	Million Gallons.	Days' Supply.	Per Area. Acres.	Mill. Gall'ns. Acres.
Chelsea	140	14·2	6½	0·68
East London	615	13·7	29½	0·67
Grand Junction	64½	3·5	17¼	0·96*
Lambeth	128	6·5	9½	0·48
New River	169	5·1	16½	0·50
Southwark and Vauxhall	66	1·8	14½	0·55
West Middlesex	117½	7·0	14	0·88

* This includes six acres of filters constructed of sand in its natural condition and used for preliminary filtration, which is succeeded by filtration through washed sand and gravel.

	Thickness of sand in Filters.		Monthly averages of Filtration per sq. ft. per hour.	
	Max. ft. in.	Min. ft. in.	Mean gals.	Max. gals.
Chelsea	4 6	3 6	1·75	1·75
East London	2 0	1 4	1·33	1·33
Grand Junction	2 0	1 3	2·0	2·35
Lambeth	3 0	2 6	2·16	2·50
New River	2 3	1 5	2·13	2·33
Southwark and Vauxhall	3 0	1 6	1·5	3·0
West Middlesex	3 3	2 6	1·27	1·37

The East London derive a supply from the gravel. They possess one well in the chalk completed, and three in the course of construction in the Lea Valley. The Grand Junction have works for flooding and collecting underground water from twenty-five acres of ballast beds. The New River Company have thirteen wells in the chalk; the water from them is mixed with that from the Lea and filtered. The Southwark and Vauxhall have works like those of the Grand Junction, occupying thirty-five acres, and have sunk a well at Streatham. The Lambeth Company collect water from the gravel subsoil at West Molesey. In all cases water from the gravel is filtered before distribution.

Changes in the rivers occasioned by rain and flood, General Scott said, are immediately perceptible in the water that is delivered. He attributed the general excellence of the Chelsea water and the power the company had of dealing with flood water to the combination it had of large storage, great thickness of sand, and considerable area of filters all combined. The value of each factor would have to be determined separately. The doubt the companies had been in as to the fate in store for them had militated against the desirable extension of their works. If we are to continue to use the Thames and the Lea, there ought to be no stint in providing to the fullest extent the necessary works for purification; and a considerable extent is required. There ought to be a minimum storage of from fifteen to twenty days' supply, and an extension of filtration. It would be important to ascertain by experiment the value of each factor, and meanwhile to level the companies up to the highest standard any one of them has adopted.

We have now completed our special report of the evidence given before the Commission. We have devoted a great many pages to the subject since the Commission held its first sittings, nearly a year ago, but we think that the very great importance of the inquiry, fraught as it is with issues of the utmost moment to the health and general well-being of London and its vicinity in the near future, has justified us in inflicting upon our readers some rather "dry" reading. Not that the evidence given before the Commission has been altogether devoid of humour. One of the most diverting incidents of the inquiry was contained in some of the evidence given on behalf of the Thames Conservators, who are apparently in favour of the continued abstraction of an enormous quantity of water from the river because they get 20,000*l.* a year from the water companies. As we pointed out at the time, the "conservation" of the river conducted on these lines might afford a capital hint for the librettist of a comic opera.

THE LONDON COUNTY COUNCIL.

THE first meeting of this Council since the Easter recess was held on Tuesday afternoon last at Spring-gardens, the Chairman, Mr. John Hutton, presiding.

Election of an Alderman.—Mr. J. Fletcher Moulton, Q.C., was elected an Alderman in the room of Lord Lingen, resigned.

Finance.—This was "Budget Day" at the Council, and Mr. Evan Spicer, Chairman of the Finance Committee of the Council, introduced the estimates for the year ending March 31, 1894. He remarked that, next to the finances of the nation dealt with in the annual Budget of the Chancellor of the Exchequer, the finances of the London County Council were the most important in the kingdom. The effect of the estimates now introduced was that the rate which was required for the County, outside the City, was 13d. in the pound, and in the City 10.7d. He hoped that the next Chairman of the Finance Committee would not have to announce two separate rates for the different sections of the County. They wished every success to the Commission now sitting to bring before Parliament a scheme that would meet the wishes of all who desired to see the unification of London. The proposed rate of 13d. was an increase of ½d. in the £ over the rate of last year, and it was accounted for as follows:—The estimated balance brought into account was less than in 1892-93 by about 26,000*l.*; increased provision was made for technical education in that year's estimate to the extent of 27,000*l.*; and the estimated expenditure was on the whole greater by about 32,000*l.*; making, with the slight decrease in the estimated receipts of 2,000*l.*, the total increase in the amount to be raised, 87,000*l.*, which was equal, after deducting the gain for improved rateable value (which was 15,238) to a rate of ½d. in the £. The rateable value at present was 33,655,848*l.*, and last year it was 33,354,946*l.* The total gross expense of the debt amounted to 1,543,070*l.*, which was made up as follows: redemption of debt, 507,946*l.*; dividend and interest, 1,018,799*l.*; management of stock, &c., 13,985*l.*; and rent, drawbacks, &c., 2,340*l.* But against that must be set the interest received on loans advanced, rents, and other receipts applicable to debt, which brought the net charge for debt to the sum he had stated. The gross debt outstanding at the present time was 30,635,169*l.*, redeemable by the 1929 3½ per cent. stock (16,961,638*l.*), the 1941 3 per cent. stock (10,850,000*l.*), and the 1949 2½ per cent. stock (2,200,000*l.*). The old debts of the late Board amounted to 623,531*l.* To outside bodies had been lent the sum of 9,820,252*l.* The value of lands held by the Council was 2,164,062*l.* The net debt owing by the Council came out at 81,426,931*l.* There were 1,055 distinct loans

now outstanding. Loans advanced to local authorities in 1892-3 amounted to 1,020,000*l.* Pensions (including asylum and prison pensions) amounted to 33,620*l.*, and establishment charges to 107,550*l.*, the salaries and wages of the headquarters staff being 76,350*l.* Judicial expenses amounted to 41,858*l.* Coming to the various services, he would point out that main drainage stood at 231,075*l.*, being less than last year's estimate by 15,300*l.*, owing to the feeling of the Committee that the improved state of the river justified a reduction in the sum for chemicals; the Fire Brigade stood at 141,100*l.*, being only a small increase; and the Parks and Open Spaces stood at 92,438*l.*, being an increase of 16,100*l.* due to the augmented pay of labourers, and the provision for new open spaces. There are now 53 parks and open spaces, representing 3,244 acres. Receipts from refreshment rooms, and the letting of boats yielded 2,300*l.* Bridges and Woolwich Ferry represented 36,510*l.*, dangerous structures 7,625*l.*, theatres and music halls 1,640*l.*, weights and measures' services 14,055*l.*, and industrial schools 25,395*l.* Pauper lunatics stood at 57,904*l.*, showing a reduction of 26,900*l.*, owing partly to the parish and poor rates now being made a charge on the Asylums Fund, and not on the County rate. Technical education stood at 57,000*l.* Other items brought the total estimated expenditure to 2,993,326*l.*, making, with the amount which they estimated would be in hand on March 21, 1894 (namely, 57,505*l.*), 3,050,831*l.* That expenditure was to be provided for as follows:—The estimated balance in hand at the beginning of the year was 182,031*l.*, being considerably larger than had been anticipated. The main item of receipts other than those from rates, was the Exchequer contribution, which was 537,435*l.* It was not safe to assume that that source of income would expand. The local taxation licences were fairly steady, showing a very slight increase. All licences collected in the County of London were placed to the credit of the Council. The estimated receipts from the local taxation licences was 421,000*l.*, and from probate duty 435,000*l.* The probate duty, which yielded so remarkably in 1891-92, had during the last year fallen off to something like its normal yield. Beer and spirit duties also did not promise to produce quite as much as in 1891-92. The second main item of receipts was the interest on loans advanced, being 355,050*l.* The third item was represented by rents (93,703*l.*). With sundry contributions, fees, fines, &c. (99,488*l.*), the total income other than from rates was 1,085,676*l.* Adding that sum to the balance, they obtained a sum of 1,267,707*l.* Deducting that from the total of the estimated expenditure, the difference (1,783,124*l.*) represented the deficiency which had to be raised from the ratepayers by means of contributions. About 84 per cent., or 1,500,490*l.*, has to be raised by a general county rate levied over the whole of the county, and 282,634*l.*, or 16 per cent., by a special county rate levied over the county outside the City. The Council must not be led away by the thought that as the increase in the rate this year was only ½d. or 1d., it would continue to grow at that low figure. Considering the increased interest to be paid on their loans and the new schemes which loomed in the distance—tramway, market, water supply, and street improvement schemes—it was imperative that new sources of income should be found. The Council could not be accused of being an extravagant body. They had much leeway to make up, and, unless they obtained some fresh sources of revenue, the rate in the future was bound to increase. They had a Government in power that was friendly to them. Would it assist them with their finance? Was it prepared to relieve the occupier, and throw more of the burden on the land? He made bold to say that London would be grievously disappointed if during the year some relief were not found.

The estimates were adopted, and the necessary resolutions for giving effect to them were also adopted, after considerable discussion.

The Hackney and Holloway Storm Relief Sewer.—The Main Drainage Committee presented the following report and recommendation:—

"On the 21st of February last, the Council upon our recommendation accepted the tender of Messrs. J. Mowlem & Co. for the extension of the above sewer from Amhurst-road to Sandringham-road, Hackney, subject to their agreeing to the Council's wages' clause, and to their filling in the schedule. Messrs. Mowlem & Co. having, however, expressed their inability to agree to the wording of the Council's clause as to the rates of wages to be paid and the hours of labour to be observed, we referred the matter to the General Purposes Committee, who have advised us not to depart in the present instance from the form of words laid down by the Council in December last, and they recommend that the work be executed by the Works Committee. We understand that there will be no difficulty in their undertaking the work immediately, and we therefore concur in the opinion of the General Purposes Committee. The Engineer's estimate of the cost of the work is 14,051*l.* We recommend—

'That, subject to an estimate being submitted to the Council by the Finance Committee as required by the statute, the work above referred to be executed by the Council without the intervention of a contractor, and that the plans, specifications, and estimates be referred to the Works and Stores Committee for that purpose.'"

The recommendation was agreed to, after some discussion, in the course of which it was suggested that the Council should reconsider the wording of its wages clause. More than one speaker, however, while of opinion that Messrs. Mowlem's request was fair and reasonable, said that the relief sewer in question was a work of urgency, and could not be delayed while the terms of the wages clause were being reconsidered.

Athletic Training for the Fire Brigade.—The Fire Brigade Committee presented the following report and recommendation:—

"The work which the junior members of the Brigade are called upon to perform makes it imperative that they should be always in the best physical condition. In order to attain this end we propose to have all the men below the first-class of firemen instructed in the use of dumb-bells and Indian clubs, and in marching and running. As it would be inconvenient to bring the men to one centre it is intended that the instruction shall be given at one station in each of the five districts. Arrangements can probably be made at a small cost for a few men to go through a course of training in order to qualify them as instructors. About 200 sets of appliances will be required, and each man will have to be provided with a pair of rubber shoes, and the total initial outlay will probably not exceed 150*l.* We are of opinion that such an expenditure would be fully justified in the interests both of the Brigade and of the ratepayers, and we have no hesitation in recommending—

'That, subject to an estimate being submitted to the Council by the Finance Committee as required by the statute, we be authorised to incur an expenditure of 150*l.* in connexion with the institution of physical drill for members of the Brigade.'"

This was agreed to after some discussion, by a large majority. Opposition was made to it by some of the members of the "Labour party," but it was clearly shown that their views were not those of the firemen themselves, who were stated to be eager for the training recommended.

By-Laws under the Public Health (London) Act, 1891.—The Public Health and Housing Committee reported as follows on this subject:—

"On the 22nd of November last we submitted to the Council the draft by-laws under sections 16 and 39 of the Public Health Act, 1891. These proposed by-laws, as required by Section 114 of that Act, were sent to all the sanitary authorities in London for observations thereon. We have received replies with various suggestions from almost all of the sanitary authorities, and have fully considered them. In some instances the suggestions have been valuable, and we have adopted them. In all cases we have tried to meet the desires of the sanitary authorities so far as was possible, having regard to the fact that these by-laws should tend to raise the standard of private and public sanitation in London. We have also received suggestions from the metropolitan branch of the Incorporated Society of Medical Officers of Health, the Royal Institute of British Architects, the Institute of Surveyors, and the Sanitary Institute, for which we desire to express our thanks.

The 30th of June is the latest date up to which the enactments to be superseded by the Council's by-laws can remain in operation. It is not clear that it is necessary the by-laws should be sent again to the sanitary authorities, but the Local Government Board has expressed to us the opinion that there is some doubt as to the interpretation of Section 114 of the Act, and recommends us to send in accordance with the provisions of that section a copy of the by-laws as now submitted to each of the sanitary authorities two months before applying for their confirmation.

The Act also directs that notice of intention to apply for confirmation of the proposed by-laws shall be advertised one month before the application for that purpose is submitted to the Local Government Board. The time at our disposal does not admit of this last month being subsequent to the two months during which the by-laws must be in the hands of the sanitary authorities, and the Local Government Board is of opinion that these two periods might be concurrent. We therefore recommend—

'That the by-laws as submitted be made and sealed, that they be sent to the sanitary authorities acting within the County of London, that notice of intention to apply to the Local Government Board for confirmation of the same be advertised as directed by section 184 of the Public Health Act, 1875, and that in due course application be made to the Local Government Board for their confirmation.'"

This recommendation was agreed to, with some verbal amendment, and after transacting other business the Council adjourned.

Correspondence.

To the Editor of THE BUILDER.

LECTURES, &c., THE ARCHITECTURAL ASSOCIATION.

SIR,—May we be allowed to remind your student readers that the lectures on "Professional Practice," by Mr. Edwin T. Hall, F.R.I.B.A., commence on April 18, and Mr. F. W. Pomeroy's class on "Modelling" on April 20?

We shall be glad to receive as soon as possible the names of those desiring to enter, so that the necessary arrangements may be made.

ERNEST S. GALE,
F. T. W. GOLDSMITH, } Hon. Secs.
56, Great Marlborough-st., W.,
April 11.

TERRA-COTTA AND STONE.

SIR,—I almost regret that it should be necessary for me to traverse so courteous a letter as that contributed by Mr. Brydon to your last issue in reply to mine of an earlier date. But with all due deference to that gentleman, I must contend that the figures quoted by him in the course of his remarks at the Institute, and which figures were put forward as conclusive, do not convey a fair representation of the *average* relative costs of terra-cotta and stone, inasmuch as neither the Battersea Polytechnic nor any public building can be taken as representing an average of buildings generally, and the price mentioned as the price of the stone was exceptional.

The figure quoted by Mr. Brydon as the cost of the Bath stone-work was 4s. 8½d. per cubic foot. In the bill of quantities one-tenth of the work in the main block was given as "enriched," and I will leave it to Mr. Brydon's professional friends, and to the building trade, to say whether 4s. 8½d. per cubic foot is a usual price for Bath stone-work of average complexity, fixed in London, and of which work one-tenth is to be carved "to the satisfaction of the architect," the price of 4s. 8½d. per cubic foot to include the cost of carving.

The price for terra-cotta certainly did include the cost of *all enrichment*, and in order to fairly compare the price of that material with stone, it would be necessary not only to include with the stone the cost of carving, but to make sure that the same amount of enrichment was executed in the stone as was provided for in the tender for terra-cotta.

Lambeth Pottery. S. H. LEECH.

The Student's Column.

CHEMISTRY.—XV.

"SETTING" OF HYDRAULIC LIMES, CEMENTS, AND MORTARS.

VERY little is known with certainty about the chemical reactions which cause hydraulic cements to *set*, but the following seems to be the most reasonable explanation. When a limestone containing clay is properly burnt, hydraulic lime, consisting of quicklime mixed with *silicate of lime* and *aluminate of lime*, is produced. The difference between *hydraulic limes* and *hydraulic cements* is due to the fact that in the cements there is less free lime and a greater proportion of the calcium silicate and aluminate, produced by the occurrence or employment in them, before burning, of a larger proportion of clay.

When water is added to a mixture of silicate and aluminate of lime, a chemical combination occurs. A crystalline solid, termed *hydrated silicate of lime*, is formed, and being insoluble in water, gradually *sets*, even when immersed in water. In a similar manner hydrated aluminate of lime and hydrated silicate of alumina are believed to be formed.

Ordinary silica, such as sand, will not combine with lime and water to form hydrated silicate of lime; but if the powdered sand is first burnt with the lime, the anhydrous powder of silicate of lime or calcium produced, will then readily combine with water to form the hydrated calcium silicate.

Silicate of calcium may be decomposed by acids, such as hydrochloric acid, into a gelatinous mass of hydrate of silica termed *silicic acid*, and calcium chloride and water. The gelatinous mass is readily soluble when warmed with a sufficient quantity of the dilute acid.

Hence, in a chemical analysis the amount of silica soluble in acid should always be given separately from the ordinary silica, which is insoluble in common acids, and which plays no chemical part in the setting of cements.

When magnesia is present in the cement or mortar, it also combines with the silicic acid, forming a double hydrated silicate of lime and magnesia, which possesses greater strength than either hydrated silicate of lime or magnesia separately.

Experiments. Group 9.

Ascertain qualitatively the composition of various limestones, limes, cements, and mortars in the following manner :—

In a test-tube place about as much of the powdered substance as can be placed upon a six-penny piece, just cover with water, and add a little HCl.

CO_2.—If much carbonate of lime or magnesia was present in the cement, a strong effervescence will be caused in the test-tube due to the liberation of CO_2.

Silicic Acid.—If much soluble silicic acid is produced, the liquid in the tube will turn to a thick jelly.

Insoluble Silicious Matter.—Add more dilute acid, and boil the contents of the tube until only an insoluble gritty residue remains. This will probably consist chiefly of sand. Filter the solution and evaporate the filtrate to *complete* dryness in a small porcelain dish.

Silica as Silicic Acid.—Now boil some dilute HCl with the dry mass. If silicic acid was present it will now appear as an insoluble white powder, and should be collected and ignited in a porcelain crucible, the acid or hydrate being decomposed by drying and heating into ordinary silica – $SiH_4O_4 = SiO_2 + 2H_2O$. The residue thus obtained may be noted down as "soluble silica," meaning that it is silica which has been brought into solution by means of an acid (HCl). Having filtered off this silica, to the filtrate add ammonia solution (NH_4OH) and ammonium chloride solution, and boil.

Oxide of Iron and Alumina.—Both oxide of iron and alumina are precipitated by this treatment, the former being red, the latter white. They are both rather gelatinous precipitates, and the red colour of the iron often conceals the presence of alumina. If the precipitate is white there cannot be much iron present. To separate a mixed precipitate of iron and alumina, collect the precipitate upon a filter paper and reserve the filtrate for the estimation of lime and magnesia. Dry the precipitate and transfer it from the paper to a beaker. Dissolve it in a little strong HCl, dilute with water, and add excess of pure potash (KHO). The oxide of iron separates out as a red precipitate and is filtered off, and to the clear filtrate some ammonium chloride is added, which after some time causes most of the alumina to separate out as a white precipitate.

Lime.—To the filtrate obtained by filtering off the first precipitate of iron and alumina, add excess of ammonium carbonate solution ; this will throw down the lime as a white precipitate of calcium carbonate. Collect it in a filter, and to the filtrate add a few drops of ammonium hydrate (NH_4OH) and some phosphate of soda solution.

Magnesia.—If any magnesia was present, a white precipitate of magnesium pyrophosphate will be produced.

In the above analysis it is assumed that, as usual, only silica, iron, alumina, lime, and magnesia are likely to be present in appreciable quantities. If other substances were present the analysis would be much more complicated.

Quantitative Analyses.

Quantitative analyses are made in a very similar manner to the above, by taking a known weight of the lime or cement, and washing, drying, igniting, and weighing the precipitates obtained. To estimate the iron and alumina quantitatively, it is best to divide the acid filtrate obtained after the estimation of the silica into two equal parts, and in one to determine the iron and alumina together gravimetrically, and in the other to estimate the iron only, by titration with a standard solution of potassium bichromate. By subtracting the iron oxide, Fe_2O_3, from the total iron and alumina, the amount of alumina is obtained.

The CO_2 is estimated quantitatively in a carbonic acid apparatus, as shown in fig. 13.

B is filled with HCl ; C contains a little strong sulphuric acid to absorb the moisture in the CO_2 gas as it is driven off ; A contains a small quantity of water. In this condition the apparatus is weighed. Some of the limestone, or other substance, in a powdered condition, is now placed in A, and the apparatus re-weighed. By this means the weight of the substance taken, and also the total weight of the apparatus, is ascertained. The

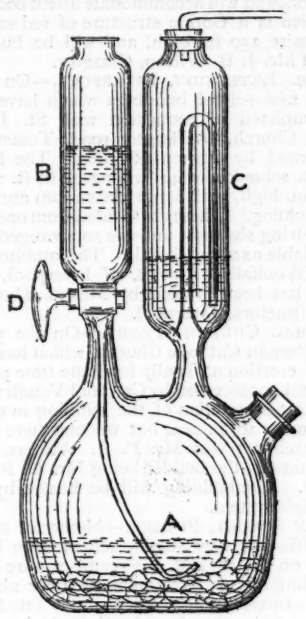


FIG. 13

tap D is now opened, so that the HCl from B runs on to the substance and water. Only a few drops of the acid are allowed to pass into A at one time, and when the effervescence ceases, a few more drops of acid are again run on to the substance. When the substance is completely decomposed, as is shown by the absence of any further effervesence when more acid is added, the apparatus is gently heated until the liquid in A is raised almost to boiling-point, so as to expel practically all the CO_2 from the liquid and apparatus. When cool, the apparatus and its contents are re-weighed. The loss in weight represents the weight of CO_2 in the amount of substance taken.

Estimation of Sulphates in Cements, &c.

Qualitative.—Place a fresh quantity of the substance in a test-tube and boil it with *dilute* HCl. Filter, and to the filtrate add some barium chloride ($BaCl_2$) solution. If sulphates of lime or magnesia were present, a dense white precipitate will be thrown down.

Quantitative. — Place say 5 grains of the powdered substance in a beaker, add about 3 or 4 ozs. of distilled water and about ½ oz. HCl, boil, and then filter off the insoluble matter. Again boil the filtrate, and while still boiling add barium chloride solution until no further precipitation is caused. Continue boiling for a few minutes, then filter and wash, dry, ignite at a bright red heat in a platinum or porcelain crucible, and weigh the white precipitate of barium sulphate ($BaSO_4$) obtained. Test the filtrate with barium chloride to show that all the sulphate has been precipitated.

Molecular Weight.		Molecular Weight.		Molecular Weight.	
Ba	137	Ca	40	S	32
S	32	S	32	O_3	48
O_4	64	O_4	64		—
	233		136		80

Now 233 parts by weight of $BaSO_4$ contain 80 parts of SO_3, and 136 parts by weight of sulphate of lime ($CaSO_4$) contain 80 parts of SO_3.

Assuming that sulphate of lime present in 5 grains of the cement yielded ·75 grains $BaSO_4$, this would be equivalent to ·437 grains of $CaSO_4$ from the 5 grains. The substance would therefore contain $8\frac{3}{4}$ per cent. $CaSO_4$. Thus

$BaSO_4$ $BaSO_4$ SO_3

233 : 0·75 :: 80 = ·257 SO_3.

Now since 136 parts $CaSO_4$ contain 80 parts of SO_3, therefore ·25 grain SO_3 will be contained in ·437 grain $CaSO_4$. Therefore 5 grains of the original substance contains ·437 grain, $CaSO_4$, which is equivalent to nearly $8\frac{3}{4}$ per cent. of $CaSO_4$ $\left(\cdot 437 \times \frac{100}{5}\right)$.

Estimation of Alkalies.

The alkaline salts, potash and soda, are very soluble in water. To estimate them, treat 10 grains of the cement repeatedly with small quantities of distilled water. Filter and evaporate the filtrate to a bulk of about 2 ozs. A little lime will also have dissolved out. To get rid of this, add an excess of ammonia, and then a small quantity of ammonium oxalate. Filter off the white precipitate, and evaporate the solution to dryness. Heat the residue to a sufficiently high temperature to drive off all the ammonium oxalate. If any residue now remains, it must consist of oxides or chlorides of soda or potash, and should be weighed. To ascertain whether the chlorides are present, re-dissolve the residue in water, and add a few drops of silver nitrate ($AgNO_3$) solution. A white curdy precipitate of silver chloride will be produced by the chlorides. If no precipitate is produced, it may be considered that the residue is composed of oxides of potassium and sodium.

Calcium Sulphate, $CaSO_4$.

This substance is found in nature as *selenite*, as gypsum ($CaSO_4 + 2H_2O$), and as alabaster.

It is found that the addition of a small proportion of certain anhydrous sulphates to a lime or cement considerably increases its setting power. The setting is due to the combination of the sulphate with a certain amount of water to form a solid sulphate containing "water of combination." Such a lime is termed *selenitic*.

Plaster of Paris is obtained by heating gypsum at a moderate heat until nearly the whole of its combined water is expelled. When the powder thus obtained is wetted it recombines with the quantity of combined water that was expelled from it by heating, and consequently *sets*.

Selenitic Cement, sometimes called selenitic lime, contains a small proportion of sulphate of lime, usually plaster of Paris, and derives its name from the native sulphate, selenite.

Sulphate of lime is slowly soluble in water. It is soluble in about 500 times its weight of water.

Keene's, Martin's, and Parian cements are plasters consisting principally of sulphate of lime.

Keene's Cement is made by soaking plaster of Paris in a saturated solution of alum and then recalcining it.

Parian Cement by mixing plaster of Paris with a strong solution of borax, calcining it, then grinding and mixing it with a solution of alum and again calcining it.

Martin's Cement is made in a similar manner to Parian cement, pearlash (K_2CO_3) being substituted for borax.

So-called *artificial marbles* are often produced by working colours into any of the above plasters.

Asphaltes.

The substance known most generally as asphalte is a mixture of limestone ($CaCO_3$) and bitumen, with more or less silicious matter.

Mineral Pitch, or bitumen, its most important constituent, is found in Trinidad and other places. The rock bitumen, which is known as natural asphalte, is found in many countries. Before being used for making roads, &c., it is usually ground and mixed with sand or other silicious matter, and a further quantity of native bitumen. It is then known as *mastic*.

Seyssel Asphalte is manufactured from a rock containing 90 to 92 per cent. of carbonate of lime, and 8 to 10 per cent. of bitumen, which is found at Pyrimont Seyssel in the Jura mountains. It is made into a mastic in the manner described above.

Val de Travers Asphalte is manufactured from a rock containing a rather larger percentage of bitumen than the seyssel rock. It is found at Neuchatel in Switzerland.

Patent British Asphalte is a mixture of quicklime, pitch, saw-dust, and ground iron slag, and is therefore an artificial asphalte.

Coal tar pitch is often employed instead of natural bitumen in the manufacture of inferior artificial asphaltes. Coal-tar pitch is the residue left after distillating coal-tar, and which solidifies on cooling to a hard black mass.

Calcium Chloride, $CaCl_2$

is formed in solution when carbonate of lime is treated with hydrochloride acid. It is a residual product from several manufactures. It is very soluble in water and rapidly absorbs moisture from the air, and is much used in laboratories for drying gases.

Calcium Fluoride, CaF_2,

is found as fluor spar or Blue John in the lead mines of Derbyshire, Cornwall, and Cumberland. It is used, as shown in a previous paper, for making hydrofluoric acid for etching glass. It is also used as a flux in smelting operations.

Symbol Ba. *Barium Atomic weight* 137.

Barium is a metal of a whitish colour. It rapidly

oxidises in the air to form barium oxide. All soluble barium salts are poisonous.

Barium Oxide, BaO, is a greyish porous mass which requires a high temperature to fuse it, and which combines with water to form barium hydrate.

$$BaO + H_2O = Ba(HO)_2.$$

Barium Hydrate, Ba $(HO)_2$, is soluble in water, and like lime-water, rapidly absorbs CO_2, forming barium carbonate $BaCO_3$. The crystals sold in commerce, as barium hydrate have the composition $Ba(HO)_2 + 8H_2O$.

Barium Chloride, $BaCl_2$, may be obtained by dissolving barium carbonate in hydrochloric acid.

Barium Sulphate, $BaSO_4$, is found native as *heavy spar*. It is precipitated as a heavy white powder when sulphuric acid or a solution of a sulphate is added to barium chloride solution. It is insoluble in water and acids except concentrated sulphuric acid. Barium sulphate is used as a paint, but has a very poor covering power; it is not, however, discoloured by sulphuretted hydrogen. It is used in large quantities for adulterating white lead and paints.

Barium Dioxide, BaO_2, is formed when air or oxygen is passed over heated BaO. Its formation during the working of Brin's Oxygen Process has been described in a previous paper.

Barium Carbonate, $BaCO_3$, is an insoluble white substance. It is found native as *Witherite*.

Barium Nitrate, $Ba(NO_3)_2$, may be prepared is dissolving barium carbonate in nitric acid. It by a soluble salt.

OBITUARY.

MR. VICAT COLE, R.A.—We regret to report that Mr. Vicat Cole, R.A., died suddenly on Thursday, the 6th inst., at his residence, Little Campden-house, Kensington, from failure of the heart's action. According to the *Times*, he was born in 1833 at Portsmouth, and was the son of Mr. George Cole, himself a landscape painter. The father was one of the chief of the "Suffolk-street men," and there, in the Galleries of the Society of British Artists, Vicat Cole made his *début* so long ago as 1852. He soon afterwards became a regular contributor to the Academy, and in 1870 was elected an Associate, and in 1880 he was elected a full Academician.

THE LATE PROFESSOR LÜBKE.—We have to record the death of that well-known and popular German writer on art-history, Professor Lübke, who died at the age of sixty-seven, was a native of Dortmund. At the age of thirty he had produced his "History of Architecture," in consequence of which he was offered the professorship of Architecture in the old Berlin Architectural Academy. His "Elements of Art-History," which has lately reached its tenth edition, gained him the Professorship at the Zürich Technical College in 1861. In 1866 he accepted a similar professorship at Stuttgard, where he remained till 1885, when he accepted a professor's chair at the Karlsruhe "Politeknikum," where he still held office at the time of his death. Besides the "History of Architecture," his works on the Architecture of the Renaissance in France and Germany were books of great service to the architectural student, and his "Art-History," and his regular contributions to the *National Zeitung* and other contemporaries, made his name well-known in Germany. He never attained, it is true, a higher position than that of being an able popular writer on art, and his inaccuracies in detail were often severely criticised by more learned specialists; but he did much nevertheless to promote general knowledge of and general interest in art among a wide circle of German readers.

GENERAL BUILDING NEWS.

NEW PRESBYTERIAN CHURCH AT DULWICH.—On the 25th ult. the memorial stone of St. James's Presbyterian Church was laid by Mr. J. A. Campbell, M.P., of Stracathro. The new church is being erected from designs by Mr. R. Watson, architect, King William-street, Strand. The builders are Messrs. Balaam Bros., of Old Kent-road. The building, which is of Gothic design, will be in stock brick, with stone dressings. Sittings will be provided for about 500 persons. There is a centre wide aisle, and naves with stone piers and arches. The pulpit is on the left-hand side of the church, and the choir will be placed in a chancel.

HIGHER GRADE SCHOOL, BATLEY, YORKSHIRE.—On the 8th inst. a higher grade school for girls was opened in Batley by Mr. W. J. Ineson, Chairman of the Batley School Board. The building is situated at Field Hill. There are five class-rooms, which together will accommodate 240 children. The centre hall, which is 50 ft. 9 in. long by 30 ft. wide, has a small gallery. The hall will be used as an assembly room, and will also be available for public meetings. On the lower floor is a room which is to be fitted up with all the necessary appliances for the teaching of practical cookery. The architect was Mr. Harry B. Buckley, of Leeds and Batley. The total cost of the building was 3,429*l.* 16s. 8d.

FREE CHURCH, AYRSHIRE.—The memorial-stone of the new St. Andrew's Free Church, Ayr, was laid on the 4th inst. by Mr. William Birkmyre, M.P. The church is situated in Bellevue-crescent, is to cost 6,000*l.*, and will accommodate about 800 persons. The edifice is a Gothic structure of red sandstone, with a spire 150 ft. high, and will be built to the design of Mr. J. B. Wilson, Glasgow.

SCHOOL EXTENSION, LIVERPOOL.—On the 5th inst. the new school buildings which have recently been completed in connexion with St. John the Baptist's Church, Wellington-road, Toxteth Park, were opened by Bishop Royston. The buildings contain a schoolroom 40 ft. long by 24 ft. wide and 16 ft. 6 in. high, with large class-room and babies' room adjoining. These are divided from one another with revolving shutters, and are so arranged as to be also available as a parish hall. The architects were Messrs. Woolfall & Eccles, of Liverpool, and the building has been erected by Messrs. Thornton & Sons, contractors, Liverpool.

CATHOLIC CHURCH, TENBY.—On the 5th inst. the new Roman Catholic Church, which has been in course of erection at Tenby for some time past, was opened and consecrated by Cardinal Vaughan. We gave a short description of the building in our issue for September 10, p. 209, but we may here mention that the architect was Mr. F. A. Walters, F.S.A., of Westminster, the builder being Mr. G. Richards, of Tenby. The building will be heated by hot air on Grundy's system.

SUNDAY SCHOOL, PUDSEY.—Memorial stones of the Ratcliffe-lane new Sunday school were laid last July, and on the 4th inst. the premises were opened. The building affords accommodation for about 650 scholars. Internally the large room is fitted with a platform at the east end. Mr. C. S. Nelson, Leeds and Fulneck, has been the architect of the building. The contractors have been as follows:—Mason work, Mr. Thomas Wood; joiner, Mr. Thomas Haton; slater, Mr. F. Thompson; plasterers, Messrs. J. Laycock & Sons; plumber, Mr. Joseph Scarth; painter, Mr. John Nicholson. Heating apparatus has been supplied by Messrs. Hargreaves & Dewhirst.

NEW NURSES' HOME AT HOLBECK, YORKSHIRE.—A branch home, in connexion with the Leeds Association for Nursing the Sick Poor, is in course of erection at Holbeck. Plans prepared by Mr. Walter A. Hobson, architect, of Leeds, were selected, and the contract for the erection of the building was let to Mr. William Barber. The exterior elevation of the building is faced with pressed bricks, and relieved with stone dressings, the roof being covered with dark Welsh slates. The ground floor comprises an entrance-hall, living rooms, kitchen, and scullery. The upper floor contains the bedrooms and bath-room.

NEW BAPTISTERY AND CHOIR VESTRY AT KIRKLEY CHURCH, SUFFOLK.—A baptistery and choir vestry have been added to Kirkley Church, at the expense of Mr. E. K. Harvey. The baptistery is placed at the south-west corner of the edifice, and measures 25 ft. long by 22 ft. 8 in. externally, with apsidal end, in which are inserted five tracery-headed windows of Bath stone. The walls are 2 ft. 6 in. thick, faced with splint flints and stone dressings. A large window of two lights is introduced in the south wall, and in the east gable end is inserted the traceried head of an old window, taken from the south aisle of the church. The roof is covered with slates, laid on boarding and felt. The walls of the baptistery internally are faced with white and red bricks, with bands of dark glazed bricks. The floor is of solid oak parquetry of ornamental pattern, and raised two steps above the floor of the church. The roof internally is of pitch pine. The five windows in the apsidal end are filled with stained glass, the subject of the centre window being "Our Saviour blessing little children." The two-light windows on the south side are glazed with cathedral glass, with borders of stained glass. The new font is of Caen stone, with carved centre pillar, and four small columns of serpentine marble. The general contractors for the work were Messrs. Elsey & Jenner, builders, of Kirkley. The stained glass windows and brass were the work of Mr. H. J. Salisbury, of St. Alban's, and the oak parquetry floor was executed by Mr. J. Ebner, of London. The Caen stone work of the font was executed by Mr. Whitehead, of Lowestoft, and the stone carving throughout by Mr. W. Savage, of Kirkley. The sculptured marble panels of the font were executed by Mr. C. H. Mabey, of London. Mr. George Versey, of Kirkley, has done the plumbers' and painters' work. The works have been carried out from the designs, and under the superintendence, of Mr. Thomas Porter, architect, Lowestoft.

NEW BUILDING ESTATE, CARDIFF.—We understand that about twelve acres of land on the Heath Estate, Cathays, opposite the Barracks, Cardiff, have been acquired by a company, which will shortly be registered under the title of "The Heath Property Company, Limited." Plans for four new streets, to be called Llanishen-street, Manor-street, Talygarn-street, and Allen's Bank-terrace, were on the 8th inst. deposited at the Borough Engineer's office by Messrs. Veall & Sant, who are the architects to the company. Upon the twelve acres about 260 houses will be erected, fifty of which will have a frontage of 18 ft. 6 in. each to Whitchurch-road, facing the Barracks Field, and eighteen will have a similar frontage to Allen's Bank-road. The depths of these plots will average 120 ft. The other plots will have 16 ft. frontages to the new streets above-named, with depths of 85 ft., and will carry small villas. The main sewers in Whitchurch-road and Allen's Bank-road will be commenced by the Corporation almost immediately.

PARISH-ROOM, CARNFORTH.—A parish-room is about to be erected at Carnforth, Lancashire, from the designs of Mr. Robert Walker, architect, Windermere.

SANITARY AND ENGINEERING NEWS.

AMBULANCE SERVICE IN LONDON.—Mr. Edward Tidman, C.E., at the request of Dr. B. W. Richardson, F.R.S., read a report on the above subject at the monthly meeting of the Sanitary Inspectors' Association, held in Carpenters' Hall, E.C., on the 8th inst. He explained that there were two principal services supported by voluntary contributions, viz., the St. John's Ambulance Association and the Hospitals' Association. The former possessed twenty-two Metropolitan stations, and the value of the service might be judged by the fact that at the Royal Agricultural Show 26, at the Military Tournament 47, and at the Naval Exhibition 479, or a total of 552 cases, had been attended by the ambulances. The annual income was about 13,000*l.*, and the expenditure about 10,000*l.* Mr. Tidman referred to the ambulance work of the Hospitals Association, which, from their last report, had attended 2,101 cases, or an average of twenty per station. The above associations do not touch "infectious cases," but the latter did remove invalids at low fixed charges to all parts of the world. With regard to infectious cases, these were dealt with by the Metropolitan Asylums' Board, which had during 1892 removed 32,000 cases. Particulars of the systems were given by Mr. Tidman; and Mr. Ryan, of the Hospitals' Association, who attended, explained the working of the newest form of ambulance carriage. Mr. Jones, on behalf of the Asylums Board, also gave some interesting details of the work, showing the speed at which the cases were dealt with after notification; and, after an interesting discussion, a vote of thanks was passed to Mr. Tidman for his report.

MAIN SEWERAGE WORKS, BOURNEMOUTH.—We understand that the tenders of Messrs. B. Cooke & Co., of Phœnix Wharf, Battersea, have been accepted for the two contracts for the new main sewers through the Central Gardens and Boscombe Chine, amounting to about 12,000*l.* The work is to be carried out under the Engineer to the Corporation, Mr. F. W. Lacy, C.E.

SEWERAGE, CLOWN.—The Worksop Rural Sanitary Authority have accepted the tender of 1,923*l.* sent in by Mr. John Bentley, of Leicester, for the construction of certain pipe sewers, and laying out sewage farm. The estimate of the engineer (Mr. W. H. Radford) for the works was 2,250*l.*, and an additional sum of 500*l.* was included for contingencies.

DRAINAGE, PENNINGTON, HANTS.—In consequence of the recommendation of the Sanitary Authority, it has become necessary to make some provision for drainage at Pennington. A committee has therefore been formed to consider the matter, and they have instructed Messrs. Pinder & Fogerty, civil engineers, Bournemouth, to prepare a scheme for the drainage of the district.

FOREIGN AND COLONIAL.

FRANCE.—The fifth exhibition of the "Société des Peintres-Graveurs" has been opened at the Durand-Ruel Gallery; it will close on April 28.——The Société des Pastellistes opened its annual exhibition last Saturday at the Georges Petit Gallery.——The formation of a new Art-Society is announced at Paris, under the title of "Société des Miniaturistes et Enlumineurs de France"; this society will also have its annual exhibition.——M. Puvis de Chavannes has been commissioned to undertake the decoration of the Public Library of Boston (United States).——The unpublished works of Meissonier belonging to his widow, and which she proposes to present to the State, will form an exhibition to be opened to-day at the École des Beaux-Arts.——In consequence of its further development, the Société Nationale des Beaux-Arts will this year occupy the large Galerie Rapp at the Champ de Mars, in addition to the galleries already occupied by it in previous years.——The Société Française d'Anthropologie has undertaken an interesting report on the characters inscribed on the well-known Celtic stone monuments of Carnac and Locmariaker, and it is hoped that the inscriptions may be deciphered.——In the ancient Roman arena at Néris-les-Bains a fine bas-relief has been discovered, executed in white stone, along with gold jewellery of Phœnician character, and some medals and effigies of Roman emperors.——The works for the construction of the fort at Truc, near Bourg-St.-Maurice, have just been commenced. The fort will be one of the most important defensive works of the frontier, near the pass of Petit-Saint-Bernard.——A committee has been formed to raise a monument to Jules Ferry by public subscription, at Saint-Dié (Vosges).——A considerable fire has

occurred in the forest of Fontainebleau, destroying one of the most picturesque portions of the forest, in the neighbourhood of Gorges d' Apremont.—— The "Union Artistique du Nord" will open this year, at Lille, an international fine-art exhibition, which will be open from August 1 to October 1. ——It is announced that the exhibition of the works of the members of the French school at Rome has been opened at the Villa Medici. It includes, in architecture, a restoration of the Pantheon, by M. Chédanne; a restoration of the Palazzo Vecchio at Florence, by M. Tournaire; a study of the temple of Vesta and the tomb of Bishop Saluti at Fiesole, by M. Sortais; drawings of various fragments from the temple of Hercules, by M. Poutremoli; and the tomb of Scipio, by M. Eustache. The drawings will be exhibited in Paris in the latter part of June.——The death is announced of M. Didier Debut, sculptor, a former pupil of David d'Angers. He was sixty-nine years of age. ——We have also to record the death of M. Ricardos, a distinguished student of coinage, who has left a valuable collection of coins to the town of Montpellier; that of M. Camille Paulin Lancelot, medallist; and that of M. Jouaust, a well-known publisher, who had created the "Bibliophile" series, among the most remarkable of which was a splendid edition of the works of La Fontaine, illustrated by the first artists of the day.

BERLIN.—The Royal Art Commission has been reconstituted by the Minister of Education. The list of members includes nine painters, two sculptors, two architects, one etcher, and two laymen. The main duties of the Commission will be the selection of works of art for the Prussian National Gallery and the examination of all art work carried out with public money. The two architects on the Commission are the vice-president of the Prussian Royal Academy, Professor Ende, and the church-specialist "Baurath" Schwechten. The two laymen are the Curator of the Gallery, Herr Jordan, and the late German Ambassador at Rome, Geh. Rath Von Kendell.——As reported in a former number, the demolition of the old cathedral dome has been put into the hands of the royal engineers. The first attempt to blow up the building was unsuccessful. The officer in charge had calculated the amount of dynamite necessary, but an all too careful civil commission that is responsible for any damage done to the neighbouring castle and museums had reduced the charge. The Emperor, who was in attendance, was much vexed at the failure. A second attempt will be made this week.——A bust of the late Professor Karl Boetticher, the archæologist and author of the "Tektonik der Hellenen," is to be placed in the Central Hall of the Royal Technical College. The necessary funds are being raised by voluntary subscription. —— In Berlin architectural circles, where there has always been much admiration for the Danish Renaissance work of Christian IV., the report that this much respected monarch is to have a statue at Copenhagen has given great pleasure.—The interest shown will probably take a substantial form.——A very well-arranged competition has been opened for plans of a 'small "colony" of dwellings destined for eighty aged artisans. The buildings are to be erected at Halle, at a cost of 25,000*l*. Among the assessors we see the names of Herr Paul Wallot, of the new Imperial Houses of Parliament, Herr Hugo Licht, of Leipsic, and Herr Schmieden, of Berlin.

MISCELLANEOUS.

THE CLOISTERS, JESUS COLLEGE, CAMBRIDGE. —The *Academy* of the 8th instant says that three thirteenth century arches have just been found under the plaster of the eastern side of Jesus College cloisters, and that they are, apparently, part of the arcading of the cloisters in the old convent. But a discovery of arches there is no new thing, for in Vol. II. of Mr. J. W. Clark's edition of Professor Willis's "Architectural History of the University of Cambridge" (reviewed by us on July 24-31, 1886), it is stated, in a foot-note, that "some years ago when the plaster was stripped off the east wall of the cloister the remains of arches were disclosed, which may have been portions of the chapter house doorway, or of the entrance to the usual passage between the chapter house and transept gable." Mr. Clark adds: "The outline of these arches may still be traced by cracks in the plaster. One of the round windows that are supposed to light the bedrooms just cuts into them." This cloister, which has no counterpart in either Cambridge or Oxford,* stands north of the nave of the conventual church, for nuns Benedictine, of SS. Mary and Rhadegund, founded in A.D. 1133. When John Alcock, Bishop of Ely, established a college here (1497) he retained the cloister, converting the church, built, with changes of its plan, in the interval 1150-1245, into the college chapel. We read that Sir John Rysley rebuilt the cloister, enlarging it by the space formerly occupied by the north aisle of the nuns' church. In Loggan's view of Jesus College, *circa* 1688, we see the deambulatory as enclosed by a wall pierced on the north side with four perpendicular square-headed windows, having three lights. The cloister has been modernised since; that feature of it is introduced into our two-page illustration, September 3, 1887, of Messrs. Carpenter and Ingelow's additions to the College, including the block of chambers (1870) designed by Mr. Waterhouse, R.A. Various portions of the chapel were restored by Salvin and by Pugin in 1846-9, and in 1864-7 by Mr. Bodley, A.R.A.

* Except, of course, cloisters in secondary courts; as that of red brick at Queens', Cambridge. Indications exist of Wolsey's intention to place a cloister around his quadrangle at Christ Church.

ELECTRIC LIGHTING AT CARDIFF.—The Corporation of Cardiff, guided by the Electric Lighting Committee, have decided upon the main lines of their scheme for the illumination of the town by electricity. The lighting station will cover about an acre of ground on the Canton Common. The site belongs to the Corporation, and is situated close to the Great Western Railway on the northern side, and at the extreme end of Eldon-road. The idea at present is to erect only one-fourth of the building, and the extension of the station will depend upon the demand for electric lighting in the town. The plans prepared by the Borough Engineer (Mr. W. Harpur, M.Inst.C.E.) show that the first portion of the station will be 82 ft. square. The space allotted for engines and dynamos will be 80 ft. by 30 ft., with a boiler-house of the same size. Behind the boiler-houses and adjoining the Great Western Railway will be the coal stores, 14 ft. by 60 ft. The chimney which it is proposed to build at first, and which appears to be the larger of the two included in the plans, will be 105 ft. high. It will be octagonal in form, and its external size will be 8 ft. 6 in. at the base. One of the reasons which induced the committee to fix upon the Canton Common site is that the station can be easily supplied with fuel, and negotiations with the Great Western Railway Company for a siding from the main line into the works are now proceeding. If a reasonable arrangement can be made a great saving in haulage will be effected. Mr. W. H. Massey, M.Inst.E.E., has prepared the details for the engines, dynamos, street mains, and services. The estimated cost of the work at present contemplated is 32,500*l*.

SOCIETY OF ENGINEERS.—At the meeting of the Society of Engineers, held at the Town Hall, Westminster, on Monday evening last, Mr. William A. McIntosh Valon, J.P., President, in the chair, a paper was read by Mr. H. Conradi on "The Cleaning of Tramway and other Rails." The author commenced by offering a few remarks with reference to street-cleaning appliances in general, and the conclusion arrived at by him was, that they do not tend to keeping tramway rails clean, but rather the reverse. He then referred to the regulations enforced by some local authorities which compel the tramway companies to leave their lines in the muddy and dirty condition engendered by the general street traffic unless mud-collectors were used in combination with the apparatus for clearing the rails. He pointed out that, although the combination of a mud-collector with an ordinary street-sweeping machine had been condemned and abandoned, several local authorities still imposed this combination as a condition on the tramway companies when using rail-cleaning machines. He also showed how prejudicial to both animal and mechanical traction dirty tram rails were, and described several machines devised for effecting their clearance. These inventions, without exception, were of rigid construction, and, therefore, incapable of accommodating themselves to the inequalities of the track. The author next described his rail-cleaning machine, in which the principal of elasticity was introduced, and was combined with lightness of construction. The first apparatus constructed by him consisted of two tubes, each containing a vertical spring. In each of these main tubes was suspended an internal tube, leaving ample clearance for free play. To each of the inner tubes was fixed a leaf spring, to which was attached the scraper-point and straight-plate, forming the cleaner. The lifting and lowering gear, carried on a cross-shaft, was worked by a connecting rod and lever from the driver's seat. After a private trial the apparatus was modified by making the scraper-spring a full coil, by making the scraping-steel and the shovel-plate separate, and the latter of angular shape, and increasing the size of each. Triangular brushes were also added. The author then proceeded to point out the action of the cleaner, which he said was subjected at one and the same time to four constantly varying conditions, viz., deviations and irregularities of the permanent way; lateral deviation of engine or car; vertical motion of engine or car; and the forward motion of the car or engine. The apparatus had been fixed to four tram-cars at Reading, and had now been in satisfactory operation for eighteen months. He described several experiments made during the running of the cars, by which it was shown that the tractional resistance met with by a car running on rails cleaned by the previous car was from 25 to 30 lb. less than when running on dirty rails. He also compared the cost of various systems of cleaning, arriving at the following results:—By hand, once a day, 1s. per mile of single line in the fine season, and 2s. per mile in the severe season. Watering by cart twice a day, 2s. 6d. per mile. By the author's rail cleaner, as often as required, 6d. per day.

THE FURNITURE TRADES' EXHIBITION.—There is not much in this exhibition (opened on the 6th inst. and to close on the 15th) of special interest to our readers, but we may mention a few items. Messrs. Tangyes exhibit a circular saw-bench and a band-sawing machine of good finish and convenient design. The Britannia Company showed a very convenient band-saw machine with inclinable table. Mr. Sydney Butler exhibited three or four very useful wood-working machines. Centres of attraction to the visitors were the three different types of wood-carving machines—two of them American and one English—which are based on the principle of the pantagraph. The machines are known as Moore's "Universal" carving machine, the "Seaman" carving machine, and the "Pneumatic Wood-carving Machine"—the last-named being the English machine. They all seem capable of doing work of about the same quality, but of necessity all "carved" work so produced must be tame and lifeless, though it is cheap. Among one or two exhibits left over from the recent Building Trades Exhibition we may mention that of Mr. Robert Adams, who has a good display of his specialities in door-springs. His square-sectioned steel spring hinge for swing doors, the "Victor," with and without check action, will compare with any we know for strength, durability, and continuity of action. His fanlight-openers, casement bolts, and safety reversible sash windows are also well and favourably known.

STANDARD GAUGE FOR MATCHED TIMBER.—Messrs. J. M. Bennett & Sons send us a specimen and description of their metal standard gauges for ordering grooved and tongued boards. These are carefully made iron standards of various sizes, distinguished by numbers, each standard giving a special size and section of groove and tongue. The idea of the patentees is that a general use of such gauges would result in a great saving of time, if all timber for matched work were made according to these gauges, and ordered simply as "No. —— Bennett's 'Glen Cove' Standard gauge." That the general adoption of such a standard gauge would be a convenience there is no doubt; but its practical utility must depend to a great extent upon its general adoption. It is worth the attention of builders and contractors.

STREET IMPROVEMENTS, READING.—On the 5th inst. Colonel W. M. Ducat, R.E., the Inspector appointed by the Local Government Board for the purpose, held an inquiry at Reading respecting an application made by the Reading Corporation for permission to borrow 16,740*l*. for the improvement of Minster-street and Wokingham-road. The plans, sections, &c., were explained by the Borough Engineer, Mr. Arthur E. Collins.

ELECTRIC LIGHTING IN EDINBURGH.—At a meeting of the Electric Lighting Sub-Committee of the Edinburgh Town Council on the 5th inst., the question was discussed at some length whether the Corporation should themselves go on to put in force their Electric Lighting Provisional Order, or hand it over to a company. By eight votes to three it was resolved that the Corporation should take the matter in hand themselves, and this recommendation will be reported in due course to next meeting of the Lord Provost's Committee.

ENGINEERING APPOINTMENT.—The post of resident engineer of the deep water lock works at Barry Dock, rendered vacant by the departure of Mr. J. Robinson, M.Inst.C.E., from the district, has been filled by the appointment of Mr. A. H. Case, Assoc.Inst.C.E., a native of the North of England. Mr. Case has, says the *Western Mail*, for years been an assistant to Mr. J. Wolfe Barry, M.Inst.C.E., of London, the consulting engineer of the Barry Railway Company.

NEW PULPIT, PEEL CAUSEWAY.—A pulpit has just been completed in St. Peter's Church, Peel Causeway, Cheshire. It is octagonal in form, and has been designed to correspond in style with the reredos which was erected last year. It is executed in variegated alabaster, and has been made from the designs of Messrs. Tate & Popplewell, by J. & H. Patteson, of Manchester.

MEETINGS.

FRIDAY, APRIL 14.

Institution of Civil Engineers (Students' Meeting).—Mr. D. Carnegie on "The Manufacture and Efficiency of Armour-plates." 7.30 p.m.

Junior Engineering Society.—Mr. R. W. Newman on "The Sanitary Engineering of Dwellings." 8 p.m.

SATURDAY, APRIL 15.

Architectural Association.—Visit to the French Protestant Church, Soho Square, by permission of the architect, Mr. Aston Webb. 3 p.m.

MONDAY, APRIL 17.

Royal Institute of British Architects.—(1) Special General Meeting (for Members only) to consider the suspension of By-law 26. (2) Ordinary General Meeting; Paper by Mr. H. W. Burrows on "Building Stones." 8 p.m.

Society of Arts (Cantor Lectures).—Mr. Lewis F. Day on "Some Masters of Ornament."—II. 8 p.m.

TUESDAY, APRIL 18.

Institution of Civil Engineers.—Discussion on the late Mr. P. W. Willan's paper on "Steam-Engine Trials." 8 p.m.

Royal Statistical Society.—Mr. Augustus Sauerbeck on "Prices of Commodities during the last Seven Years." 7.45 p.m.

Builders' Clerks' Benevolent Institution.—Annual Dinner, Cannon-street Hotel, E.C. 6.30 p.m.

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITIONS.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered.
Water Supply Improvement	Rathdrum (Ireland) Union	.....	May 5
School Buildings	Llandovery Girls Schs Committee	.....	No date
*School Buildings	Colchester Sch. Bd.	.....	do.

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
Police Station and other Buildings, Duns	Berwickshire C. C.	J. Jerdan	April 18
Slaughter Houses	Workington U.S.A.	W. L. Eaglesfield	do.
Chapel, Lodge, and various Works at Cemetery, Hemingfield	Wombwell Local Bd.	J. Robinson	do.
Thirty Cottages, Gelligaer, Wales	Bedlinog Building Club	.....	do.
Six Houses, Seaton Delaval	Mr. Roseby	.....	do.
Foundations, Basements, &c.	Dover Town Council	*Official*	do.
*Pulling-down Houses	Acton Local Board	do.	do.
Strong Room, &c.	Chester - le - Street Union	do.	do.
Drain Pipes, &c.	Heaton Norris Loc. B.	do.	April 19
Setts, Kerbs, &c.	do.	do.	do.
Turned and Bored Cast-iron Gas Mains	Leeds Corporation	do.	do.
Post Office, Ashton-under-Lyne	.....	T. George & Son	do.
Mission Church, Parish Room, &c. Fleetwood	.....	W. Cornall	do.
Sewering, Making, and Completing One Street	Birkenhead Corp.	C. Brownridge	do.
Flagging, Sewering, Channelling, &c. (several passages)	do.	do.	do.
Additions, &c. to Town Hall	North Shields Corp.	J. T. Smillie	do.
Cast-iron Water-pipes, &c. (136 tons)	Torquay Town Council	T. S. Weeks	do.
Several Shops, &c.	Pontypridd Market Co.	A. O. Evans	do.
Additions, &c. to Premises, Stairfoot, Barnsley	.....	H. Crawshaw	do.
Construction of Baths	Southampton Corp.	W. B. G. Bennett	do.
Pulling-down and Re-building Premises, South Shields	.....	J. H. Holmes	do.
Retaining and Boundary Walls	Sheffield Union	C. J. Innocent	do.
Construction of Reservoir	Cork Union	Mr. Coakley	April 20
Cottage, &c.	Kilmallock Union	J. Carroll	do.
Sewerage Works, Spital	Berwick - upon - Tweed U.S.A.	Mr. Dickinson	do.
Dispensary, &c.	Manorhamilton Union	Rawson, Carroll, & Batchelor	do.
Making-up, Metalling, Paving, &c. (one street)	Wednesbury Corp.	E. M. Scott	do.
Pipe Outfall Sewer, 12 in. (3,468 ft.)	Christchurch Corp.	*Official*	do.
Constructional Ironworks, &c. at Gasworks	Salford Corporation	do.	do.
*Cleaning and Painting Works	M. R. Co.	do.	do.
*Painting, &c. &c. at Infirmary	Fulham Union	do.	do.
Reconstruction of Bridge, Fingrinhoe, Essex	Essex County Council	P. J. Sheldon	April 21
Church, School, &c. Ossett	.....	R. Castle	do.
Business Premises, Maldon, Essex	Mrs. Wade	P. M. Beaumont	do.
*Pipe Sewers, &c.	Cuckfield Union	Wm. Beach	do.
Paving, Flagging, Channelling, &c. Austerlands, Oldham	Quickmere Local Board	J. Nuttal	April 22
Several Houses, Alterations, New Street, &c. Bank Top Mills, Great Horton	.....	J. Drake	do.
Restoration and Re-building Stone Bridge, Inverness	.....	C. R. Manners	do.
Two Shops, Dwellings, &c. Camborne	W. W. Hockin	J. Hicks	do.
Additions, &c. to School Buildings	Fulbourn (Cambridge) School Board	.....	do.
Twenty-two Houses, Whaley Bridge, Lancs	Radcliffe Printing Co. Ltd.	J. Sellars	do.
Two Semi-Detached Villas, Wrexham	J. Burton	J. Morison & Son	do.
*Levelling Land, Maidstone	Athletic Ground Com.	Tootell & Sons	do.
Re-building Chimney Stack at Workhouse	Baltinglass Union	*Official*	do.
Cottage, Williamstown, Ireland	do.	do.	do.
Sewerage Works, at Hospital	do.	do.	do.
Sewerage Works, Castletownshend	do.	do.	do.
Carriage Shed, &c. Glasgow	Skibbereen Union	do.	do.
Brick and Iron Pipe Sewer	Glasgow and South-Western Railway Co. Ltd.	do.	April 24
*New Gas Works, &c.	Swansea Town Council	do.	do.
*Administrative Block, &c. N.W. Fever Hospital	Wallasey Local Board	do.	do.
Cottage, &c.	Met. Asylums Board	Pennington & Bridgen	do.
Sewerage Works, Urmston	Canterbury Corp.	F. Baker	do.
Excavating, Forming, Paving, &c. (six streets)	Barton - upon - Irwell R.S.A.	Mr. Hooley	do.
Road Works Sewers, &c. Chiswick	Blackburn Corporation	J. B. McCallum	do.
C.I. Fence, Brickwork, and Stone Copings, &c.	.....	F. & W. Stocker	do.
Sanitary Conveniences, &c.	Canterbury Corp.	F. Baker	do.
Providing and Laying Water Mains, &c. Mansfield	Luton School Board	J. R. Brown & Son	do.
Dwelling House, Ravensthorpe	Sutton - in - Ashfield Local Board	G. Hodson	do.
	.....	F. W. Ridgeway	do.

CONTRACTS—*Continued.*

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
Laying-out, Sewering, &c. three acres of Ground, Blackwell, Derby	Mansfield R.S.A.	B. Walker	April 29
Flags, Kerbs, Setts, &c.	Bury Corporation	J. Cartwright	do.
*Sewers Works	West Ham Council	Lewis Angell	do.
*Pipe Sewer, &c.	Willesden Local Board	O. Claude Robson	do.
Distillery, Manager's House, Excise Officer's House, &c. Knock, Banff	Distillers' Co. Ltd.	Gordon & MacBey	do.
Additions, &c. to School Buildings, Southampton	St. Mary Extra Sch Bd	Mitchell, Son, & Guttebridge	do.
Additions, &c. to School Buildings	Portsmouth Sch Bd	A. H. Bone	do.
Impounding Works, C.I. Water Mains, &c.	Saltash Corporation	W. W. Harvey	do.
Street Construction (eight streets)	West Hartlepool Corp.	J. W. Brown	do.
Twenty Cottages, Solfrydd Estate	Crumlin (Wales) Building Club	T. C. Wakeling	do.
*Stone Paving Setts	Dublin Corporation	S. Harty	April 28
*Making-up and Paving Road	Fulham Vestry	W. Sykes	do.
*Wood Paving and Other Works	do.	J. P. Norrington	do.
Erection of Casual Wards	Chelsea Union	A. & C. Harston	do.
Additions, &c. to School Buildings	Hereford School Board	Nicholson & Son	do.
*Works at Aylesbury	G.W.R. Co.	*Official*	do.
*Premises, Swansea	Messrs. B. Evans & Co.	Jones & Rowlands	do.
Boundary Wall, &c.	Enfield Local Board	W. Kitteringham	do.
*Sewerage Works	Borough of Godalming	H. Moon, & S. Welman	do.
*Sewerage Disposal Works	Loughborough T. C.	A. W. Cross	do.
*Broken Granite	Hackney Bd. of Wks.	*Official*	do.
Five Dwelling-houses, Maryport	J. G. Sprott	C. Eaglesfield	April 27
Construction of Reservoir (250,000 gals.) Charminster	Dorset County Council	G. T. Hine	do.
*Additions to Mortuary	St. George in the East Vestry	*Official*	do.
Re-building Quays, &c.	Totnes Endowed School Governors	W. F. Tollitt	do.
*Valve and Governor House	Sheffield Gas Light Co.	T. W. Stevenson	April 28
Removal of existing Buildings, and Construction of Hotel, Holy Island, Alnwick	T. Lamb	M. T. Wilson	April 29
*Broken Granite	Middlesex C.C.	*Official*	do.
Church, Abergwynfi, near Maestag	.....	Halliday & Anderson	May 1
*Erection of School	Heywood Corporation	Woodhouse & Willoughby	do.
Three Chapels, Entrance Lodge, &c. at Cemetery, Ryecroft	Walsall Corp.	R. H. Middleton	do.
Granite Kerbs (2,000 ft.), &c.	Hastings Corp.	P. H. Palmer	do.
Chapel, Buckfastleigh, Devon	.....	C. G. S. Acock	do.
*Works and Repairs, Liverpool	Com. of H. M. Works	*Official*	do.
*Pulling-down Old and Erecting New Bridge	Somerset C. C.	do.	do.
*Main Sewerage Works	Belfast Corporation	do.	May 2
Sewage Disposal Plant, &c.	Glasgow Police Com.	G. V. Alsing	do.
*Iron Railing and Gates	Torquay Corporation	H. O. Garrett	do.
*Erection of Thirty-four Houses, Leeds	North-Eastern Railway	W. Bell	May 3
*Sewerage Works	Barry and Cadoxton Local Board	C. R. Walker	May 8
*Extension of Infirmary	Glamorganshire & Monmouthshire Infirmary	Seward & Thomas	do.
*Superstructure of New Asylum	Sunderland Asylum	G. T. Hine	May 27
*Construction and Maintenance of Sewerage Works	City of Cape Town	Clement Dunscombe, Jones, Richards, & Budgen	July 29
Coach-house, Stables, &c Radyn, Wales	.....	.....	No date
Pulling-down Existing Buildings and Erection of Seven Dwelling-houses, Grimsthorpe, Sheffield	.....	R. Dawson	do.
Church, Bargoed, Wales	Rev. T. J. Jones	E. M. Bruce-Vaughan	do.
Additions to Working Men's Institute, Lower Wortley	.....	F. W. Rhodes	do.
Two Houses, Armley, Leeds	W. Brogden	do.	do.
*Residence, Epsom	.....	J. Hatchard Smith	do.
*Boiler and Heating Appliances	Bosmere & Claydon U.	J. S. Corder	do.
Villa Residence, Buckhurst Hill	S. G. Hough	J. Sawyer	do.
Flagging, &c.	Andenshaw (Lancs.) Local Board	J. H. Burton	do.
*Formation of New Roads	Duke of Devonshire	C. J. Ferguson	do.
Pulling-down and Re-building Business Premises	Denton & Houghton Co-operative Society	J. D. Lindley	do.
Club Premises, Atherton	Liberal Club Com.	J. C. Prestwich	do.
Business Premises, Sheffield	W. Whiteley	.....	do.
Two Cottages, Hallbankgate, Carlisle	Naworth Collieries Co-operative Society	.....	do.
Two Dwelling Houses, Ellenborough	J. Reed	.....	do.
*Boundary Walls, Roads, &c.	Sheffield Union	C. J. Innocent	do.
*Two Pairs of Villas, Brockley-road	.....	Ed. Clarke	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.
Clerk of Works	Llantrisant Sch Bd.	104*l.*	April 18
Road Foreman	Wandsworth District Board of Works	104*l.*	do.
Road, &c. Surveyor (Keighley)	Steeton-with Eastburn Township	.....	do.
*Sanitary Inspectors	Islington Vestry	104*l.* each	April 22

Those marked with an Asterisk (*) are advertised in this number. *Competitions, p.* iv *Contracts, pp.* iv., vi., viii., ix. *and* xxiii. *Public Appointments, p.* xx.

WEDNESDAY, APRIL 19.

British Archæological Association. — Lieutenant-Colonel Lambert, F.S.A., on "Caerleon-on-Usk." 8 p.m.

Society of Arts.—Mr. Gisbert Kapp on "Some Economic Points in Connexion with Electricity Supply." 8 p.m.

Royal Meteorological Society.—Four papers to be read. 7 p.m.

Society of Biblical Archæology.—4.30 p.m.

THURSDAY, APRIL 20.

Institution of Civil Engineers. — Students' visit to the Croydon Irrigation Farm at South Norwood, and subsequently to the Well and Reservoir at Addington. 2 p.m.

Institution of Mechanical Engineers.—General Meeting: Paper by Professor W. C. Roberts-Austen on the Second Report to the Alloys Research Committee. 7.30 p.m.

Society of Antiquaries.—8.30 p.m.

Dundee Institute of Architecture.—Mr. F. Young on "The Influence of Minute Quantities of Impurities on the Properties of Useful Metals." 8 p.m.

FRIDAY, APRIL 21.

Institution of Mechanical Engineers.—General Meeting (continued). 7.30 p.m.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

5,682.—SASHES: *J. White.*—This invention relates to a novel apparatus to be fitted to sashes of windows, or other movable frames, obviating the necessity for sash cords and weights, and permitting the sash to be raised or lowered and holding it automatically in the same position. It consists of a metal box, fitted with a disc, or wheel of india-rubber, gutttapercha, or other material, solid or inflated, acted upon from the back of the box by a spring, or it may be minus the spring when desired.

5,852A.—DOOR CHECKS: *S. Hill and R. Hodges.*—This specification relates to the manner in which pistons are constructed for working in connection with hydraulic cylinders, used for door-checking purposes, or closing buffers, or for other purposes, whereby the perishable packing at present employed for keeping such pistons tight and preventing leakage may be dispensed with. The inventors arrange within the cylinder their improved piston, connected to the piston-rod in any ordinary manner. This piston is formed as a hollow cylinder, having one end tubular, and the other end arranged with a conical seat to receive a piston valve plug. This plug is caused to fit at its outer end the bore of the cylinder in which the piston works, and there is formed upon it a tapered or conical bearing piece having a stud or projecting pin connected to its smaller end. This projecting pin is caused to pass through a hole arranged in the piston, the hole being of larger diameter than the pin for permitting a free passage of the liquid through the same. Upon the outer end of the pin is placed a perforated washer to prevent the pin being drawn right through the hole out of the piston. A channel or slot is cut through the tubular piston in diagonal form from end to end for permitting the water to pass from one side of the piston to the other, and also for causing the piston to expand. The bearing surface of the piston plug within the cylinder is preferably reduced by cutting grooves or channels upon the portion fitting the cylinder.

12,648.—WATER-CLOSETS: *W. H. Munns.*—This invention has reference to improvements in water-closets for their more efficient flushing and ventilation. The bowl of the water-closet is preferably constructed of earthenware of the usual shape. A channel is formed integrally therewith around the top edge. This channel communicates with the interior of the bowl through a series of slots. An opening leads from the channel and is arranged in line coincident with it, a coupling adapted to be passed through a wall, or other support, being connected with the opening. Suitable openings are formed in this coupling, having connections with a vent-pipe and an overflow-pipe. The bowl is provided with a flushing run and with a water supply therefor. There is also the usual opening in the lower portion of the bowl connected with the soil-pipe.

20,380.—PIPE JOINTS: *J. Weeks.*—This invention relates to an improved method of connecting and jointing sewer, drain, gas, water, or any pipes where water or gas-tight joints are necessary, and to insure a perfect joint by means of lead, cement, or other suitable composition. A groove is formed on the inside of the socket, and a corresponding groove on the outside of the spigot of an ordinary sewer drain, gas, water, or other pipes, the said socket having a runner or feeding-hole for the purpose of filling these grooves, and making a complete joint; the corresponding grooves in spigot and socket when in position are directly opposite each other, and give an area that will admit any liquid material to be poured in and fill up the annular space or groove through the runner or feeding-hole in the socket.

NEW APPLICATIONS FOR LETTERS PATENT.

MARCH 27.—6,414, G. Henn, Window-sash Fasteners.—6,429, D. and J. Keith, Fittings for Windows.—6,437, L. Pavlovitch, Hinging and Fastening, Doors, Windows, &c.—6,461, C. Norris and G. Richmond, Heating, Cooling, and Ventilating Buildings, &c.—6,486, J. Robertson, Utilising Waste Slate.

MARCH 28.—6,544, L. Hovaux, Apparatus for Cutting Glass.—6,547, H. Hansen and W. Walker, Ventilators.

MARCH 29.—6,589, D. Donald and J. Lime, Ventilators.—6,608, A. Giddings and J. McNaughton, Water-Closets and other Cisterns.—6,619, M. Garthorn, Hand-Sliding Bolts for Securing Doors, Windows, Gates, &c.—6,620, D. Allman, Water-closets.—6,643, C. Coates, Automatically Closing Doors, Windows, &c.—6,661, Craven, Dunnill, & Co., Limited, and F. Smith, Tiles.—6,674, J. Apsey,

flushing Apparatus and Water-waste Preventer for Water-closets.

MARCH 30.—6,708, F. Sator, Process and Composition for Polishing Wood.—6,726, W. Reynor, Prevention of Fracture of House and other Drain-pipes.—6,731, J. Petitjean, Coverings or Hangings, Cornices, Mouldings, &c., for Walls or Ceiling.—6,752, G. Strong, Plumb-rule and Level combined to answer Five Purposes.—6,757, G. Calvert, Latching Bolts applicable to Rein, Mortice, and other Locks.—6,761.—W. Anstey, Gas Brackets.—6,781, W. Hegenscheidt, Hinges or Hinge Plates for Use on Doors, Casements, Windows, &c.

PROVISIONAL SPECIFICATIONS ACCEPTED.

1,645, J. and J. Wilson, Chimney and other Cowls.—1,919, J. Barnsley, Ball Taps.—2,650, C. Porter, Slide Hinge.—3,074, J. Allan, Plumb-levels, &c.—4,129, W. Bostwick, Machinery for the Manufacture of Metal Lathing.—4,185, T. Anderson, Domestic Fire-grates.—4,403, M. Ozbirn and R. Reasons, Improved Gate.—4,500 A. and S. Franklin, T and Set Squares.—4,545, T. Falconer, Window-sash or Fanlight Openers.—4,735, G. Jukes, Opening and Closing Doors.—4,739, F. Cole and J. Rosa, Combined Burglar Alarm and Door Fastener.—4,797, C. Rice, Portable Door Stop for Preventing Doors being Shut.—4,908, J. Armshaw, Controlling Window-sashes.—4,921, C. Leni, Disinfecting Water-closets, &c.—4,953, H. Budden, Window-sash Fasteners.—5,069, L. Waghorn, Flushing Cisterns.—5,551, R. and J. Shaw, Automatic Saw Sharpening Machine.

COMPLETE SPECIFICATIONS ACCEPTED.

(Open to Opposition for Two Months.)

10,132, T. Riordan, Sash-fastener.—20, G. Bray, Lighting and Ventilating Rooms.—959, F. Ryan, Roofs and Roofing Plates.—2,335, J. Kleine, Construction of Floors and Ceiling.—2,691, E. Naylor, Cranes.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

APRIL 5.—By *T. Wakefield:* 2, 2A, and 4, to 24 even, Newlyn-rd., Tottenham, u.t. 84 yrs., g.r. 68*l.* 5s., 1,750*l.*; 59, Home-rd., Battersea, u.t. 84 yrs., g.r. 5*l.*, 165*l.*—By *Flood & Sons:* 21, Gloucester Walk, Kensington, u.t. 50 yrs., g.r. 7*l.*, r. 70*l.*, 710*l.*—By *E. Evans:* 2, St. Mary's-rd., Ilford, f., 225*l.*; 1, Lidyard-rd., Highgate, u.t. 92 yrs., g.r. 9*l.*, r. 33*l.*, 260*l.*; 24, Ingersoll-rd., Shepherd's Bush, u.t. 18 yrs., g.r. 6*l.* 6s., 320*l.*; 86 and 90, Strode-rd., Willesden, u.t. 93 yrs., g.r. 12*l.*, r. 67*l.* 12s., 320*l.*; 79, Harrington-rd., Norwood, u.t. 48 yrs., g.r. 8*l.* 2s. 6d., 130*l.*—By *W. Spearman:* 8, Balham-grove, Balham, u.t. 77 yrs., g.r. 7*l.* 7s., r. 32*l.*, 300*l.*—By *Newbon & Co.:* L.g.r. of 30*l.*, St. Edmund's-ter., Primrose Hill, u.t. 26 yrs., 440*l.*; L.g.r. of 25*l.*, u.t. 26 yrs., 300*l.*; l.g.r. of 8*l.*, Margaret-st., Clerkenwell, u.t. 23 yrs., 80*l.*; l.g.r. of 10*l.*, Coldharbour-lane, Brixton, u.t. 8 yrs., 40*l.*; 22 to 34 (even), Myrtle-st., Highbury, u.t. 56 yrs., g.r. 10*l.*, 690*l.*; 42 to 48 (even), Myrtle-st., u.t. 18 yrs., g.r. 8*l.*, 200*l.*; 62, Drayton-pk., Holloway, u.t. 83 yrs., g.r. 10*l.*, 480*l.*; 60, Drayton-pk., u.t. 83 yrs., g.r. 10*l.*, 470*l.*; 91, Bolsover-st., Portland Estate, u.t. 17 yrs., g.r. 25*l.*, r. 130*l.*; 166, 168, 170, 170A, and 172, Great Portland-st., u.t. 11 yrs., g.r. 200*l.*, 1,260*l.*; "Avon Lea" and "Glencoe," Peterborough-rd., Harrow, f., r. 103*l.*, 1,310*l.*; 9, Oakfield-rd., Tollington Pk., u.t. 83 yrs., g.r. 8*l.* 8s., r. 48*l.*, 450*l.*; 14, Oakfield-rd., u.t. 83 yrs., g.r. 12*l.*, r. 56*l.*, 550*l.*—By *Wilkinson, Son, & Welch* (At Brighton): 28, Chatham-pl., Brighton, f., r. 38*l.*, 800*l.*; 3, Bath-st., f., 65*l.*; 45, Red Cross-st., f., r. 26*l.*, 490*l.*; 20, Kingsbury-rd., f., 335*l.*; 25, 26, and 27, Jersey-st., f., 680*l.*

APRIL 7.—By *D. J. Chattell:* 51, Welbeck-street, Cavendish-sq., u.t. 6 yrs., g.r. 50*l.*, 690*l.*

[*Contractions used in these Lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.]

PRICES CURRENT OF MATERIALS.

TIMBER.

Greenheart, B.G. ton	9/0/0	0/0/0
Teak, E.I. ..load	9/0/0	15/0/0
Sequoia U.S.ft.cu.	2/3	2/6
Ash, Canada load	2/10/0	4/0/0
Birch, do.	3/0/0	4/0/0
Elm, do.	3/10/0	4/10/0
Fir, Dantzic, &c.	1/10/0	3/5/0
Oak, do.	3/0/0	5/5/0
Canada	5/10/0	7/0/0
Pine, Canada red	2/10/0	3/10/0
Do. Yellow	2/10/0	4/10/0
Lath, Dantzic, fath	5/0/0	6/0/0
St. Petersburg..	5/0/0	7/0/0
Deals, Finland 2nd & 1st std 100	7/0/0	9/10/0
Do. 4th & 3rd ..	6/10/0	7/0/0
Do. Riga	6/10/0	8/0/0
St. Petersburg, 1st yellow	10/0/0	14/0/0
Do. 2nd yellow..	8/0/0	9/0/0
Do. white	8/0/0	10/0/0
Swedish	7/0/0	15/10/0
White Sea	8/0/0	16/10/0
Canada, Pine 1st	21/0/0	28/10/0
Do. do. 2nd	15/10/0	17/10/0
Do. do. 3rd &c.	7/10/0	10/5/0
Do. Spruce, 1st	8/10/0	11/0/0
Do. do. 3rd & 2nd	6/15/0	8/0/0
New Brunswick	6/10/0	7/10/0
Battens, all kinds	3/0/0	15/0/0
Flooring boards, sq., 1 in. prep. 1st	0/9/0	0/15/6
Do. 2nd	0/8/0	0/11/6
Other qualities—	0/4/6	0/7/6
Cedar, Cuba ..ft.		
Honduras, ..&c	/4	/4½
Mahogany, Cuba	/4	/4½
St. Domingo, cargo av.	/4½	/6½
Mexican do. do.	/4	1/6
Tobasco do. do.	/3½	/4½
Honduras do. ..	/3½	/6½
Box, Turkey ton	/4½	/6
Rose, Rio	4/0/0	13/0/0
Bahia	9/0/0	20/0/0
Satin, St. Domingo .....ft.	8/0/0	28/0/0
Porto Rico	0/0/6	0/1/3
	0/0/7	0/1/6

TIMBER (*continued*).

Walnut, Italian ..	0/0/3½	0/0/7

METALS.

Iron—Pig, in Scotland .....ton	2/1/0	0/0/0
Bar, Welsh, in London	5/17/6	6/0/0
Do. do. at works in Wales.....	5/7/6	5/10/0
Do. Staffordshire, in London.....	6/0/0	6/10/0
COPPER—British, cake and ingot	47/15/0	48/5/0
Best selected ..	49/5/0	49/15/0
Sheets, strong ..	56/10/0	57/10/0
Chili, bars	44/16/3	45/3/9
YELLOW METAL lb	0/4 13-16	/0/5
LEAD—Pig, Spanish.....ton	9/15/0	0/0/0
English com. brands	9/17/6	10/0/0
Sheet, English, 6 lbs. per sq. ft. and upwards....	11/5/0	0/0/0
Pipe.....	11/15/0	0/0/0
ZINC—English sheet.....ton	21/10/0	0/0/0
Vieille Montagne	22/0/0	0/0/0
TIN—Straits.....	93/10/0	94/0/0
Australian	94/5/0	94/15/0
English Ingots..	97/0/0	97/10/0
Banca	94/0/0	94/10/0
Billiton	94/0/0	94/10/0

OILS.

Linseed .....ton	20/3/6	20/5/0
Cocoanut, Cochin	29/0/0	29/10/0
Do. Ceylon	27/0/0	0/0/0
Palm, Lagos.....	30/0/0	30/10/0
Rapeseed, English pale	25/0/0	25/10/0
Do. brown	23/15/0	0/0/0
Cottonseed ref....	23/10/0	0/0/0
Oleine	23/0/0	24/0/0
Lubricating, U.S.	4/0/0	5/0/0
Do. refined	5/10/0	12/0/0
TAR—Stockholm barrel	0/18/6	0/0/0
Archangel	0/12/6	0/0/0

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.*]

ABERAMAN.—Accepted for the erection of school buildings for the Aberdare School Board. Mr. Thomas Roderick, architect, Clifton-street, Aberdare:—
John Morgan, Monk-street, Aberdare.....£1,293 0 0

ASHFORD (Middlesex).—For the erection of villa residence at Ashford, Middlesex, for Mr. W. Jenkins. Mr. John Job Wood, architect, 4, Khyber-road, Battersea. Quantities supplied:—

Barker	£757 0 0	Bates	£704 4 7
Martin	753 0 0	Bilham	699 10 0
Robinson & Francis..	705 3 0		

BURNHAM (Bucks).—For the erection of two cottages for Capt. E. Bacon. Messrs. Sargent & Sons, architects, Wellington-street, Slough:—

J. Atkins	£380	Painter & Allder, Burnham (accepted).....	£275
G. Almond	310		

BURY (Lancs).—Accepted for fittings for the seating of the Royal Hotel, Bury. Messrs. Maxwell & Tuke, architects, 41, Corporation-street, Manchester:—
John Allen, Radcliffe £354 0 0

CAERPHILLY.—For the erection of two houses for Mr. James Moses. Mr. Edmund Jones, architect, Caerphilly:—

Mundro	£430	Abbott, Caerphilly*	£406
Speat.....	420	* Accepted.	

CARDIFF.—For forming, metalling, paving, &c., Walker-road, for the Corporation. Quantities by Borough Engineer:—

R. Smith	£911 13 10	D. Love & Sons	£811 2 6
J. Rich	866 7 3	Ellis & Davies*	697 15 1
[All of Cardiff.]		* Accepted.	

COOKSTOWN (Ireland).—For the construction of reservoirs, laying mains, &c., for supplying the town with water, for the Union Guardians:—
John McNally, Cookstown £1,838 17 10

CROYDON.—For the erection of a house in Park-lane, Croydon. Mr. E. Haslehurst, architect, 7a, Laurence Pountney Hill, E.C.:—
Young & Lonsdale £1,111 10 0

DALTON-IN-FURNESS.—For the erection of a manual instruction school, at the Board School, Broughton-road, for the District School Board:—

R. Townley	£627 6 7	R. P. Nelson, Dalton-in-Furness*	£590 17 0
James Garden.....	599 10 0	* Accepted.	

DORKING.—Accepted for new outfall works. Mr. J. Lemon, M.Inst.C.E., engineer:—
B. Cooke & Co., Battersea £5,374 0 0

DUBLIN.—For erecting four cottages on the Pembroke Estate, Sandymount, for Mrs. J. F. Doyle. Mr. W. G. Doolin, M.A., architect, 20, Ely-place, Dublin. Quantities by Mr. D. W. Morris, surveyor, Dublin:—

Collin Bros.	£1,260	Mellon.....	£1,120
Donovan	1,210	Monks.....	1,100
Harpur	1,165	Kelly, & Sons	1,090
Brien	1,160	Johnson (accepted)	1,054
Breen	1,125		

EGHAM (Surrey).—For erecting two villa residences at Englefield Green, for Mr. T. Robinson. Mr. J. W. Oades, architect, Egham:—

E. K. Willet	£2,366	Beauchamp & Rowland ..	£2,130
W. Watson	2,248		

FEATHERSTONE (Yorks).—For the erection of offices, surveyor's house, stables, sheds, and steam roller shed, &c., for the Local Board. Mr. Walter H. Fearnley, architect, Station-lane, Featherstone, Yorks. Quantities by the architect:—

R. Leake & Son	£2,050 0	Jackson Bros.....	£1,930 0
Stamford Saw Mills ..	2,038 0	Atkinson & Son	1,914 10
Cross & Carter	1,988 0	Chas. Brown, Gomersal*	1,895 0
		* Accepted.	

FLACKWELL HEATH (Bucks).—For the erection of new stables, Flackwell Heath, Bucks, for Mr. E. Dickson Park. Mr. Arthur Vernon, architect, 29, Cockspur-street, London:—

J. Barker & Co.	£1,072 0	Loosley, Son & Pearce, High Wycombe*	£780
C. H. Hunt	797 0	* (Accepted.)	
G. H. Gibson	794 10		

HASTINGS.—For the erection of technical school buildings, Manor-road, Mount Pleasant, for the United District School Board. Messrs. Elworthy & Son, architects, London-road, St. Leonard's. Quantities by the architects:—

F. D. Foord.....	£3,783 3 3	Eldridge & Crutten-den	£2,692 0 0
P. Jenkins	2,990 0 0	D. Snow.....	2,675 0 0
T. Salter	2,880 0 0	F. Cruttenden	2,585 0 0
H. E. Cruttenden ..	2,857 0 0	W. Small, Hastings*	2,523 0 0
J. Simmonds	2,850 0 0	W. Elliott	2,395 0 0
Moon & Garner	2,800 0 0	Architect's estimate	2,850 0 0
W. E. Warman	2,700 0 0	* Accepted.	

HORNCASTLE (Lincs.).—For the restoration of Scamblesby Church, for the Vicar and Churchwardens. Mr. R. H. Fowler, architect, Louth:—

Harrison Bros.	£980 0	Walter & Hensman	£864 0
Green Bros.....	973 10	Richard Mawer, Louth*	850 10
Harrison & Son	964 0	* Accepted.	

HOUGHTON (Hants).—For the erection of a teacher's residence at the school. Mr. John Hillary, architect, Longparish, Hants:—

Gilbert	£424	Grace	£356
Annett	375	Palmer	338

KING'S-LYNN.—For the construction of a sewer with manholes, &c., Norfolk-street, for the Corporation. Mr. E. J. Silcock, C.E., Borough Surveyor, King's Lynn:—

H. Collison	£116 0	W. Bardell	£103 0
S. Hipwell	109 10	[Engineer's estimate £110.]	

LLANDAFF.—For the erection of school buildings, for the Managers of the National Schools. Messrs. Halliday & Anderson, architects, 19, Duke-street, Cardiff:—

T. Richardson.....	£820 0 0	H. Davies.....	£727 0 0
W. Cox	819 0 0	Bowers & Co.....	719 15 0
D. Roberts	761 0 0	J. Rodger, Cardiff* ..	710 0 0
C. Dunn.....	750 0 0	E. C. Newby	692 7 5
		* Accepted.	

LLANDILO.—For building a detached villa residence for Mr. William Griffiths, Bank-terrace, Llandilo. Mr. David Jenkins, architect, Llandilo:—

David Evans	£980	Thomas Brothers*	£600
Evan Jones	790	David Jones.....	579
S. Deakins.....	725	* Accepted.	

LONDON.—For additions, &c., to the South London Granaries, Coldharbour-lane, S.W., for Messrs. Osborne & Young. Mr. R. Cruwys, architect, Bank-chambers, 465, Brixton-road, S.W. Quantities by Messrs. Franklin & Andrews, 25, Ludgate-hill, E.C.:—

Higgs & Higgs	£2,100	Lorden & Sons	£1,867
Holliday & Greenwood ..	2,058	Turtle & Appleton	1,782
Balaam Bros.	2,007	Rodwell	1,775
Carmichael	1,870		

LONDON.—For the erection of twenty-three houses, Doggett-road, Catford, for Mr. H. George Smallman. Messrs. F. & W. Stocker, surveyors, 90-91, Queen-street, Cheapside, E.C. No quantities:—

Newmans, Limited £7,890	0	J. H. Jefford.....£5,520	0
J. Stone..... 7,600	0	G. F. James 5,353	0
Sloman 7,130	0	E. Parker 5,336	0
Pryor..... 7,015	0	G. R. Story 5,225	0
W. Smith 6,995	0	J. Watt, Wildfell-road, S.E.* 5,014	0
Bulled & Co. 6,675	0	F. C. Stokes 4,458	0
R. Peters 5,980	0	* Accepted.	
J. E. Edwards 5,692	10		

LONDON.—For the erection of new premises at the corner of Central-street and Powell-street, E.C., for Mr. H. Hopton:—

Hawtrey & Son.....£2,105	0	Beer £1,920	0
C. Ansell 2,076	0	Elkington & Son 1,804	14
Young & Lonsdale 1,941	0		

LONDON.—For the erection of stables at 372, Goswell-road, for Mr. Elliott. Quantities by Mr. Wootton Williams. Mr. J. Douglass Mathews, architect:—

Dove Bros. £1,975		Larter.....£1,793	
Williams & Son 1,938		Killby 1,740	
Lowne 1,923		McFarlane 1,737	
Howell J. Williams 1,798		Lawrence & Sons 1,681	
Goodall 1,794		Sheffield Bros..... 1,655	

LONDON.—For the erection of three houses and shops at the corner of New-road and Russell-place, Woolwich, for Messrs. Birts & Son. Mr. H. H. Church, architect. Quantities supplied by Mr. W. Whincop:—

Kirk & Randall £2,800		H. L. Holloway £2,500	
Chessum & Sons..... 2,669		Balaam Bros..... 2,430	
Multon & Wallis..... 2,598		Young & Lonsdale 2,429	
F. Tarrant 2,535		Jas. Chapman 2,293	

LONDON—For the erection of new premises at the corner of Powell-street and Central-street, E.C., for Messrs. H. Heinrich & Co.:—

Hawtrey & Son.....£2,296	0	Hoare £1,913	0
Barrett & Power 1,987	0	Pickering..... 1,746	5
Elkington & Son 1,940	0	H. Wall & Co. 1,746	0
Beer 1,930	0	Young & Lonsdale 1,795	0

LONDON.—For sanitary and drainage work at Hanover-street Board School, Islington, N., for the School Board for London:—

Williams & Son £943		McCormick & Son £855	
Houghton & Son 895		H. Knight & Son, Tottenham (accepted) 785	
Grover & Son 884			

LONDON.—For cleaning, painting, &c., at Portman-place Board School, E., for the School Board for London:—

White & Son £318	0	Corfield £230	0
Calnan 255	0	H. Knight & Son, Tottenham* 226	10
Gibb & Co..... 241	10	* Accepted.	
Vigor & Co. 234	0		

LONDON.—For erecting chimney shaft at Matthias-road Board School, for the School Board for London:—

Kirby & Chase £175		Britton £110	
H. Knight & Son 122		Neil 110	

LONDON.—Accepted for new staircase, &c., at the Gunmakers' Hall, for the Gunmakers' Company. Mr. W. Lambert, architect:—
N. Lidstone, Finsbury-park £365 0 0

LONDON.—For new counters and general bar fittings at the "Hummums" Hotel, Covent Garden, for Messrs. Woods & Barnes. Messrs. Dickinson & Paterson, architects, 5, John-street, Adelphi, W.C. No quantities:—

Mark Patrick & Son £1,340		Edwards & Medway £1,079	
Drew & Cadman..... 1,245		Kearley..... 1,049	
Patman & Fotheringham.. 1,193		Dearing & Son, Islington 937	
Bush (too late) 1,154			

LONDON.—For the erection of warehouse, Margaret-street, Hackney. Mr. W. H. Punnett, architect, 63, Moorgate-street, E.C.:—

Rogers.....£1,875		Shurmur (accepted) £1,665	
Cogman 1,669		Luscombe 1,552	

LONDON.—Accepted for alterations at 34, Holborn-viaduct, for the National Telephone Co. Mr. W. E. Deane, architect:—
Maxwell Bros. £279 0 0

LONDON.—Accepted for new fittings, &c., at 243, Walworth-road, S.E., for Mr. B. Soddy:—
Maxwell Bros £216 0 0

LONDON.—Accepted for alterations at 8, King William-street, E.C., for Mr. W. Kirkland. Mr. Walter Graves, architect. Quantities by Mr. G. Francis:—
Maxwell Bros. £2,100

LONDON.—For new brass shop front at 8, Deptford Broadway, for Mr. A. Lewis. Mr. T. H. Holdsworth, architect:—

Morgan.....£110	
Maxwell Bros. (accepted)..... 108	

MERTHYR TYDFIL.—Accepted for erecting nave, aisles, and transepts of Catholic Church, Merthyr Tydfil, for the very Rev. Bernard Stephen Canon Wade, O.S.B. Mr. Joseph Stanislaus Hansom, architect, 27, Alfred-place West, South Kensington. Quantities by Mr. Henry Smith, 8, John-street, Adelphi, W.C.:—
Thomas Rees, Merthyr Vale £4,466 0 0

PORTSMOUTH.—Accepted for partly rebuilding the "Osborne" Tavern, Commercial-road, Portsmouth, for Messrs. Lush & Co. Messrs. Rake & Cogswell, architects, Landport, Portsmouth:—
J. Croad, Portsmouth £824 0 0

READING.—For cleaning, painting, colouring and other works in the Town Hall and Municipal Buildings, for the Corporation. Mr. Arthur E. Collins, Borough Engineer and Surveyor:—

Jason East £298	10 6	Childs (accepted) £220	0 0
Keen & Chandler 274	0 0	[All of Reading.]	

SKEWEN (Wales).—For the erection of a chapel for the Calvinistic Methodists. Mr. Benj. Williams, architect, 111, Western-street, Swansea:—

Thos. Watkins & Jenkins £2,889	13 7	David Rosser £2,575	0 0
John Davies 2,750	0 0	Rees Llewellyn* .. 2,550	0 0
Abraham George .. 2,635	0 0	David Roberts..... 2,450	0 0
		* Accepted.	

SURBITON.—For erecting new bakehouse and stables, 27, Richmond-grove, Surbiton, for Mr. R. Ribbins. Mr. W. H. Duffield, architect:—

F. P. Lucen..... £360	0	Dunn £312	10
Rushworth 320	0	Glass & Co. 310	10
Jarvis..... 315	0	Babbs Bros 309	0

THIRSK.—Accepted for additions to school buildings, Sowerby, for the Manager of the St. Oswald's National Schools. Mr. T. Stokes architect, Thirsk. Quantities by the architect:—

Bricklayer, Mason, and Plasterer.—W. Jackson	Total.— £480
Carpenter and Joiner.—R. Lee.....	
Slater.—W. Dodgson	
Plumber and Glazier.—T. Amos	
Painter.—T. White	
[All of Thirsk.]	

TIPTON (Staffs.).—Accepted for alterations to school, Dudley Port, and enlargement of Tipton Green School, for the School Board. Mr. Alfred Long, architect, 319, High-street, West Bromwich:—

Dudley Port Alterations.

J. Moore & Son, Ocker Hill, Tipton £192	10 0

Tipton Green Enlargement.

William Willetts, Old Hill.....£563	0 0

TRURO.—For the erection of a chapel and sexton's residence at the Cemetery, for the Urban Sanitary Authority. Mr. W. Clemens, City Surveyor, architect, Truro :—

Clemens & Tippet	£1,186 0	C. & J. Harris (accepted)	£945 5
Jas. Julian	1,050 0	[All of Truro.]	

TWICKENHAM.—Accepted for erecting new schools for the Rev. Edmund English. Mr. Joseph Stainslaus Hansom, architect, 27, Alfred Place West, South Kensington. Quantities by Mr. Henry Smith, 8, John-street, Adelphi, W.C. :—

Messrs. Oldridge & Sons, Norbiton £1,209 0 0

WANSTEAD.—For erecting a cottage hospital for the Wanstead Local Board of Health. Mr. John T. Bressey, architect, 70, Bishopsgate street, E.C. :—

	Tender No. 1.*	Tender No. 2.†
A. Reed & Son	£1,096 0 0	£1,225 0 0
F. Braby & Co.	772 0 0	800 0 0
J. U. Davis	749 0 0	798 0 0
S. J. Scott	709 0 0	765 0 0
J. Seagrave & Co.	700 0 0	—
I. Dixon & Co.	698 0 0	725 0 0
Wrinch & Sons	698 0 0	733 0 0
J. Holland	663 0 0	688 0 0
D. Charteris	660 0 0	850 0 0
T. Osborne & Sons	625 0 0	—
Morton, Francis & Co., Ltd.	612 0 0	650 0 0
E. C. Keay	593 0 0	635 0 0
Croggon & Co.	587 10 0	610 0 0
E. Spencer & Co.	578 0 0	599 15 0
D. Rowell & Co.	572 0 0	599 0 0
W. Glover & Son	571 0 0	608 0 0
Bruce & Still	570 0 0	—
W. Harbrow	520 4 0	545 0 0
Humphreys & Co.	497 0 0	512 0 0
Blackwall Iron Co.	494 10 0	535 10 0
H. B. Hobbs	490 0 0	520 0 0
J. Jolliffe	472 0 0	494 0 0
W. Mundy	465 0 0	485 0 0
C. H. Binney	447 13 9	465 6 5
M. D. Wills, 100, Bennerly-road, Clapham-junction, S.W.	380 0 0	—
Surveyor's Estimates	525 0 0	555 0 0

* If paid for within 3 months of completion.
† If paid for in four half-yearly payments, commencing at Midsummer, 1893.

WATFORD (Herts).—For erecting a pair of houses for Messrs. Broad & Riggall. Messrs. J. E. K. & J. P. Cutts, architects :—

Clifford & Gough	£1,884	Wm. Judge	£1,841
C. Brightman	1,875		

WEST BROMWICH.—For the erection of a laundry at the District Schools, for the Managers. Mr. Thos. Rollason, architect, High-street, West Bromwich. Quantities by the architect :—

J. Harley & Son, Smethwick £1,411 0 0

WEST HAM.—For constructing and supplying municipal organs, for the Corporation of West Ham :—

	Town Hall, Stratford.	Public Hall, Canning Town.
Gray & Davison	£2,050	£2,050
Bishops & Son	1,895	1,940
Beale & Thynne	1,750	1,750
J. J. Binns	1,650	1,650
A. W. Smith	1,600	1,600
Wm. Hill & Son	1,500	1,550
H. Speechley & Sons	1,440	1,440
T. H. Browne	1,430	1,365
Bevington & Sons	1,417	1,417
Forster & Andrews, Hull*	1,374	1,374
E. Ingram	1,295	1,275
Norman Bros. & Beard	1,259	1,259
H. Wedlake	1,250	1,250
A. Monk	1,170	1,140
F. A. Slater	950	950
J. W. Walker & Sons	—	2,390
Bedwell & Son	—	1,400
J. Conacher & Sons	—	1,340

* Accepted for Town Hall, Stratford. Consideration of tenders for the organ for Public Hall, Canning Town, adjourned.

WORKSOP.—For the construction of pipe sewers, laying-out small sewage farm (4¾ acres), &c., for the Rural Sanitary Authority. Mr. W. H. Radford, C.E., Angel-row, Nottingham :—

Green & Makin	£3,355 13	Holmes & Co.	£2,480 13
C. Green	2,930 0	F. Messom	2,200 0
H. Vickers	2,715 2	J. F. Price	2,094 0
J. Jackson	2,664 2	J. Holme	1,964 6
F. Eyre	2,588 16	J. Bentley, Leicester*	1,923 0

* Accepted.

SUBSCRIBERS in LONDON and the SUBURBS, by prepaying at the Publishing Office, 19s. per annum (or 4s. 9d. per quarter), can ensure receiving "The Builder," by *Friday Morning's Post*.

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom, at the rate of 19s. per annum PREPAID. To all parts of Europe, America, Australia, New Zealand, India, China, Ceylon, &c. 26s. per annum. Remittances (payable to DOUGLAS FOURDRINIER) should be addressed to the Publisher of "THE BUILDER," No. 46, Catherine-street,) W.C.

TO CORRESPONDENTS.

J. C. (amounts should be sent).—F. S. B. (ditto).—H. C. (ditto).—E. W.—A. McG.—C. S.—Rev. J. B. C.—R. A. B.—W. S. (one list held over by architect's request).—W. C. (no space this week).—J. W. (ditto).—W. T. (ditto).—T. B. (shall have consideration).—A. J. D.—C. J. F.—G. A.—W. S. C. (too late).

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

PUBLISHER'S NOTICES.

Registered Telegraphic Address, 'THE BUILDER,' LONDON.

CHARGES FOR ADVERTISEMENTS.

SITUATIONS VACANT, PARTNERSHIPS, APPRENTICESHIPS, TRADE, AND GENERAL ADVERTISEMENTS.

Six lines (about fifty words) or under ..... 4s. 6d.
Each additional line (about ten words) ..... 0s. 6d.

Terms for Series of Trade Advertisements, also for Special Advertisements on front page, Competitions, Contracts, Sales by Auction &c., may be obtained on application to the Publisher.

SITUATIONS WANTED.

FOUR Lines (about thirty words) or under..... 2s. 6d.
Each additional line (about ten words) ..... 0s. 6d.
PREPAYMENT IS ABSOLUTELY NECESSARY.

*** Stamps *must not* be sent, but all small sums should be remitted by Cash in Registered Letter or by Postal Orders, payable to DOUGLAS FOURDRINIER, and addressed to the Publisher of "THE BUILDER," No. 46, Catherine-street, W.C.

Advertisements for the current week's issue are received up to THREE o'clock p.m. on THURSDAY, but "Classification" cannot be guaranteed for any which may reach the Office after HALF-PAST ONE p.m. on that day. Those intended for the front Page should be in by TWELVE noon on WEDNESDAY.

SPECIAL.—ALTERATIONS IN STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same must reach the Office before 10 a.m. on WEDNESDAY.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c., left at the Office in reply to advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

PERSONS Advertising in "The Builder," may have *Replies addressed to the Office, 46*, Catherine-street, Covent Garden, W.C. *free of charge*. Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage.

AN EDITION Printed on THIN PAPER, for FOREIGN and COLONIAL CIRCULATION, is issued every week.

READING CASES, { NINEPENCE EACH. / By Post (carefully packed), 1s.

W. H. Lascelles & Co.

121, BUNHILL ROW, LONDON, E.C.

Telephone No. 270.

HIGH-CLASS JOINERY.
LASCELLES' CONCRETE.

Architects' Designs are carried out with the greatest care.

CONSERVATORIES,
GREENHOUSES,
WOODEN BUILDINGS,
Bank, Office, & Shop Fittings.

CHURCH BENCHES & PULPITS.

ESTIMATES GIVEN ON APPLICATION.

The Builder Cathedral Series

1891.

*1. Canterbury	*Jan.* 3	*5. Wells	*May* 2	9. Norwich	*Sept.* 5
*2. Lichfield	*Feb.* 7	6. Exeter	*June* 6	10. Rochester	*Oct.* 3
*3. St. Alban's	*Mar.* 7	7. Salisbury	*July* 4	11. Lincoln	*Nov.* 7
*4. Peterboro'	*April* 4	8. Bristol	*Aug.* 1	12. Gloucester	*Dec.* 5

1892.

13. St. Paul's	*Jan.* 2	17. Llandaff	*May* 7	21. Bangor	*Sept.* 3
14. Hereford	*Feb.* 6	18. Oxford	*June* 4	22. St. Asaph	
15. Chichester	*Mar.* 5	19. Southwell	*July* 2	23. Winchester	*Oct.* 1
16. Ely	*April* 2	20. Worcester	*Aug.* 6	24. Truro	*Nov.* 5
		25. St. David's	*Dec.* 3		

1893.

*26. York	*Jan.* 7	28. Chester	*Mar.* 4	30. Carlisle	*May* 6
27. Ripon	*Feb.* 4	29. Manchester	*April* 1	31. Durham	*June* 3

*Post-free FOURPENCE HALFPENNY each, except Nos. 1, 2, 3, 4, 5, and 26, which are *out of print*; but reprints of the VIEW, PLAN, AND DESCRIPTION of CANTERBURY, LICHFIELD, ST. ALBAN'S, PETERBOROUGH, and WELLS can be had, price EIGHTPENCE each, and of YORK, price ONE SHILLING and FOURPENCE. Postage and packing extra :—Single sets, 2d. or the six sets together, 6d.

THE REREDOS, ST. PAUL'S.

Reprinted from "THE BUILDER," January 28, 1888 (15 in. by 11¾ in.), on stout paper, unfolded, for framing, 6d.; by post, 8d.

PORTFOLIOS,

for Preserving the Plates unfolded, 2s. 6d.; by post, 3s.

London: Publisher of "THE BUILDER," *46, Catherine-st. W.C.*

THE BATH STONE FIRMS, LTD.
BATH,
FOR ALL THE PROVED KINDS OF
BATH STONE.
FLUATE, for Hardening and Preserving Calcareous Stones and Marbles.

DOULTING STONE.
CHARLES TRASK & SONS,
DOULTING, SHEPTON-MALLET.
London Agent:
E. A. WILLIAMS, 16, Craven-st., Strand, W.C.

HAM HILL STONE.
The attention of Architects is specially invited to the durability and beautiful COLOUR of this material. Quarries well opened. Quick despatch guaranteed. Stonework delivered and fixed complete. Samples and estimates free. Address, The Ham Hill Stone Co., Norton, Stoke-under-Ham, Somerset. London Agent: Mr. E. A. Williams, 16, Craven-st., Strand, W.C. [ADVT

CRAIGLEITH STONE.
UNEQUALLED for Staircases, Steps, and Landings, especially for Public Buildings with great wear. VERY HARD, and NEVER WEARS SLIPPERY.
SOLE AGENTS for England,
J. & A. CREW, Cumberland Market, London, N.W.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 42, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds and milk-rooms, granaries, tun-rooms, and terraces. Asphalte Contractors to the Forth Bridge Co. [ADVT.

QUANTITIES, &c., LITHOGRAPHED accurately and with despatch.
METCHIM & SON, 20, Parliament-st., S.W
"QUANTITY SURVEYORS' TABLES AND DIARY," For 1893, price 6d. post 7d. In leather 1/- Post 1/1. [ADVT.

SPRAGUE & CO.,
LITHOGRAPHERS,
Employ a large and efficient Staff especially for Bills of Quantities, &c.
4 & 5, East Harding-st., Fetter-lane, E.C. [ADVT

FOR HOSPITAL, ASYLUM, SCHOOL

ARCHITECTS should see our "PRESTO" (PATENT Self-Acting Closet Seat and Cistern. A flush is absolutely secured whenever Closet is used, either in the ordinary way, or for slops or urinal.

There is no awkward or complicated machinery. It looks like an ordinary Pedestal Closet Seat. It can be adapted to common hoppers, or the most elaborate Pedestal Closet. One observer says:—"It works like magic." It is entirely new, and unique in its simplicity.

It can be seen at our Offices.

FOR MANSION, COTTAGE, HOTEL.

JOHN KNOWLES & CO. MANUFACTURERS.

Depots at Star Wharf, Regent's Canal, King's Road, St. Pancras, N.W.; Midland Railway Goods Stations, St. Pancras, and Child's Hill and Cricklewood; London and North-Western Railway Goods Station, Old Ford, Bow, E.; North London Railway Goods Station, Hammersmith and Chiswick, W.; London and South-Western Railway Station, Twickenham.

Goods delivered by Vans in loads of not less than 30 cwt. to any part of London. Shipping Orders promptly executed.

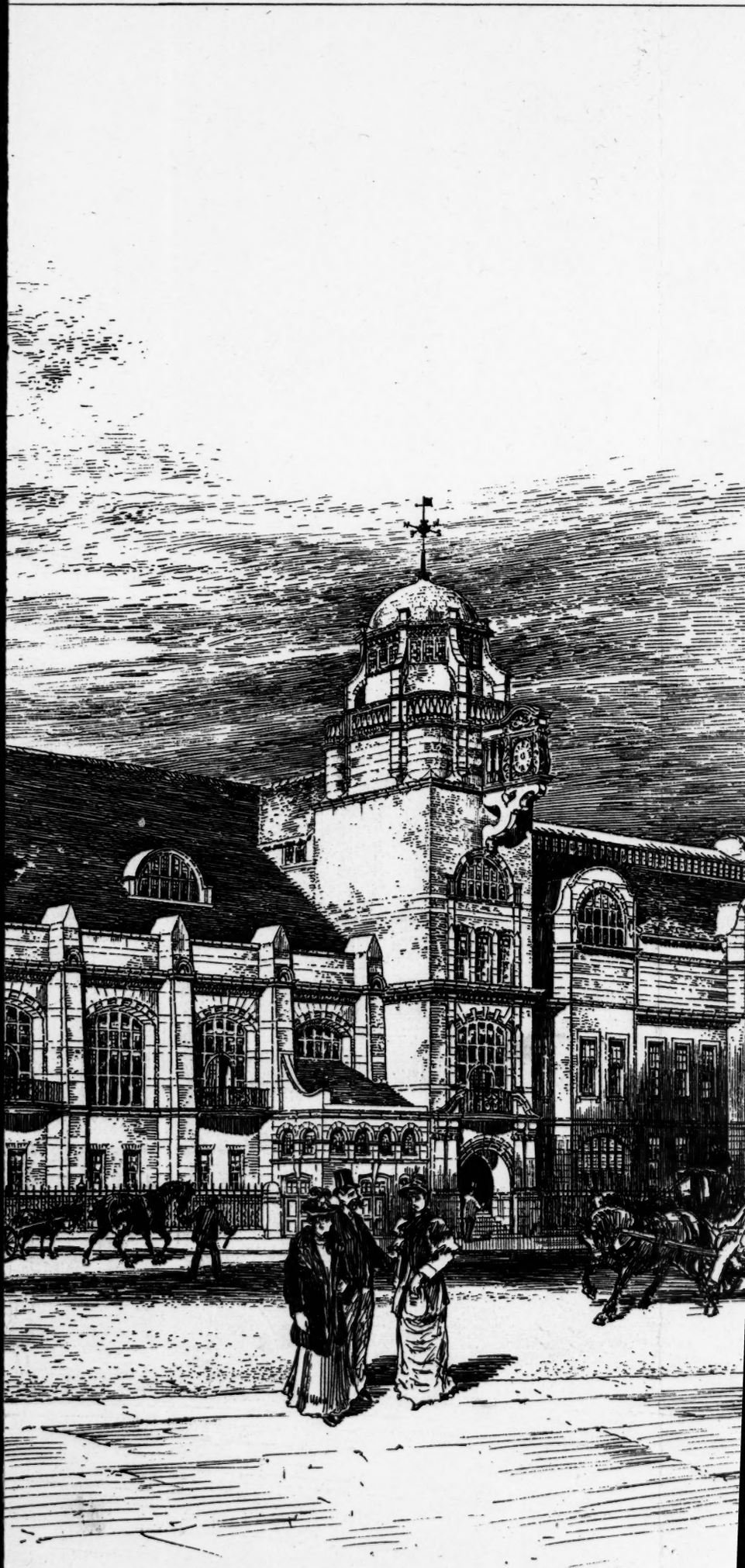
ILLUSTRATED PRICE LISTS ON APPLICATION.

Works: Wooden Box, Burton-on-Trent. Sheffield Office & Depot: 35, Green Lane. Nottingham Office: Brougham Chambers, Wheeler Gate.

Chief London Office: 38, KING'S ROAD, ST. PANCRAS, N.W.

Telegraphic Addresses—London Office, "JOHN KNOWLES, LONDON" Works Office, "KNOWLES, WOODVILLE." London Telephone No. 7557
Sheffield Telephone No. 11

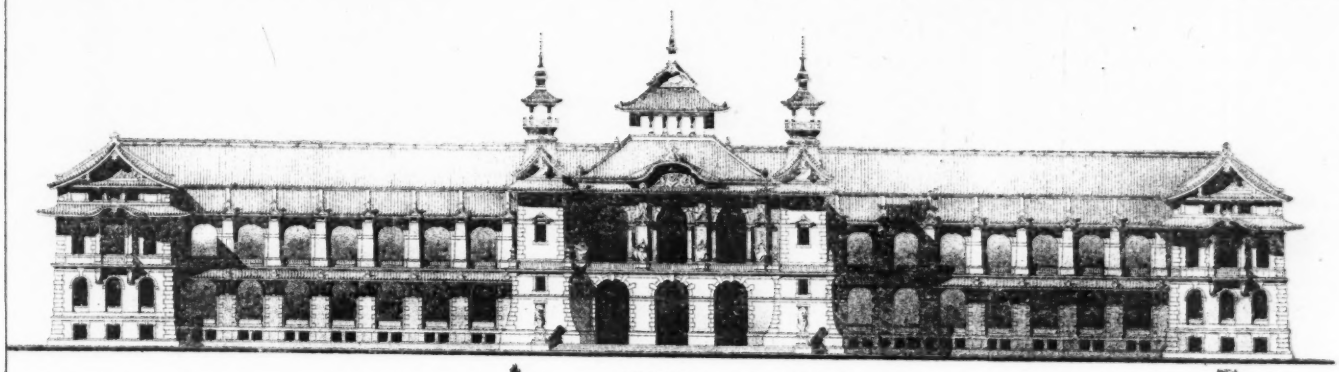
SELECTED DESIGN FOR THE NORTHAMPTON INSTITUTE, CLERKENWELL



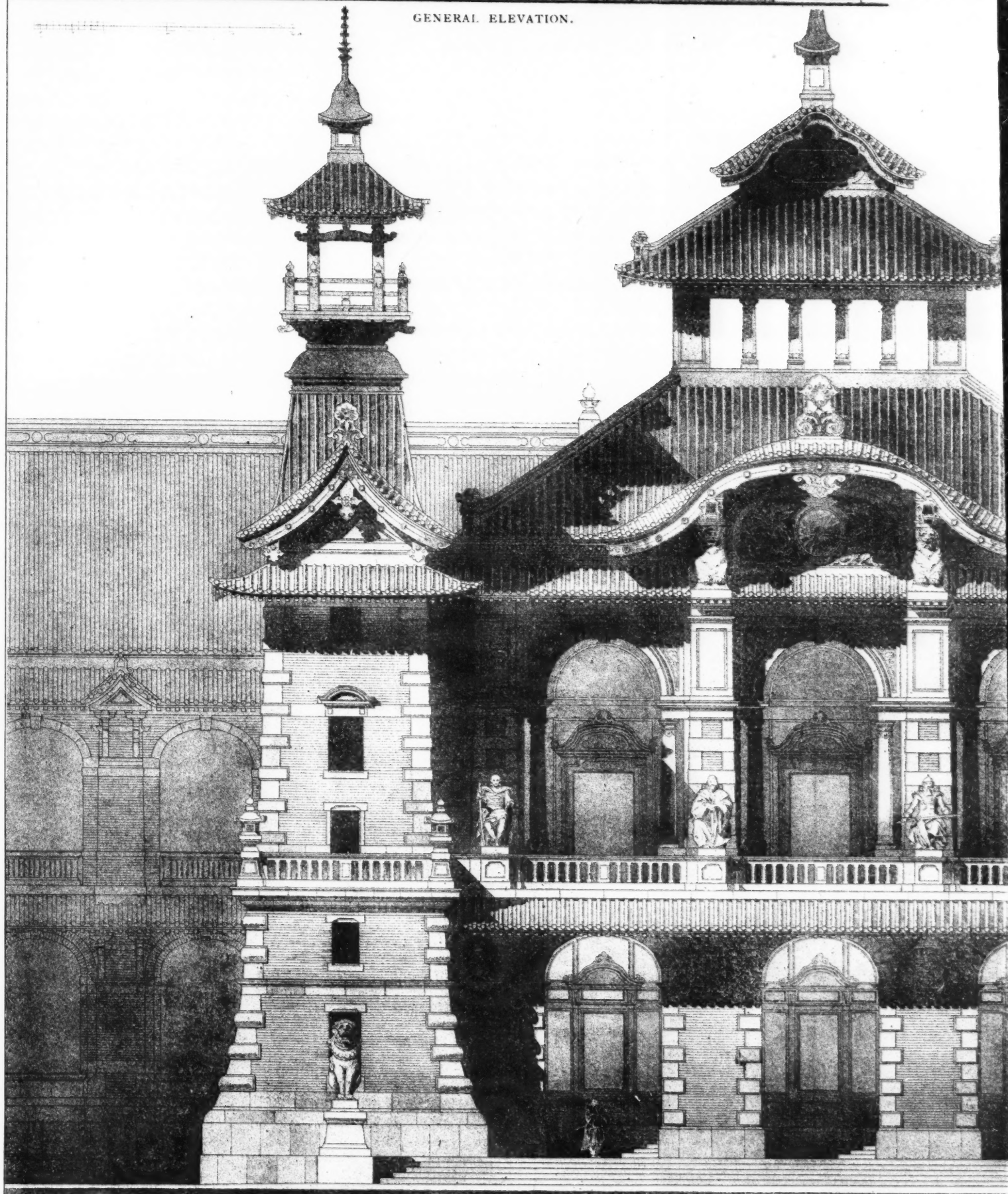
PTON INSTITUTE, CLERKENWELL.—Mr. E. W. Mountford, F.R.I.B.A., Architect.

PHOTO-LITHO. SPRAGUE & Co 4 & 5 EAST HARDING STREET, FETTER LANE, E.C.

HITECT.



GENERAL ELEVATION.

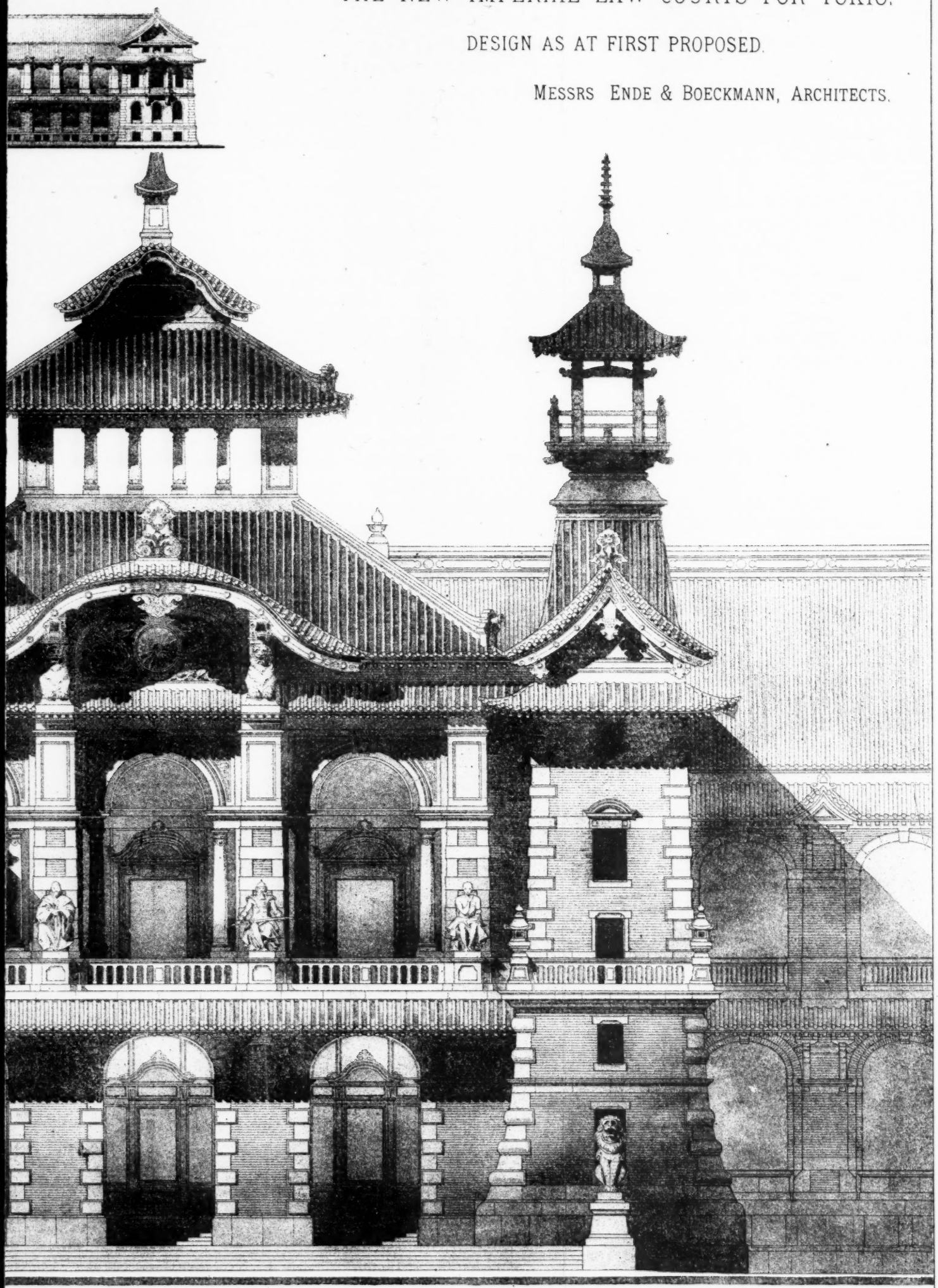


DETAIL OF CENTRAL PORTION.

THE NEW IMPERIAL LAW COURTS FOR TOKIO.

DESIGN AS AT FIRST PROPOSED.

MESSRS ENDE & BOECKMANN, ARCHITECTS.



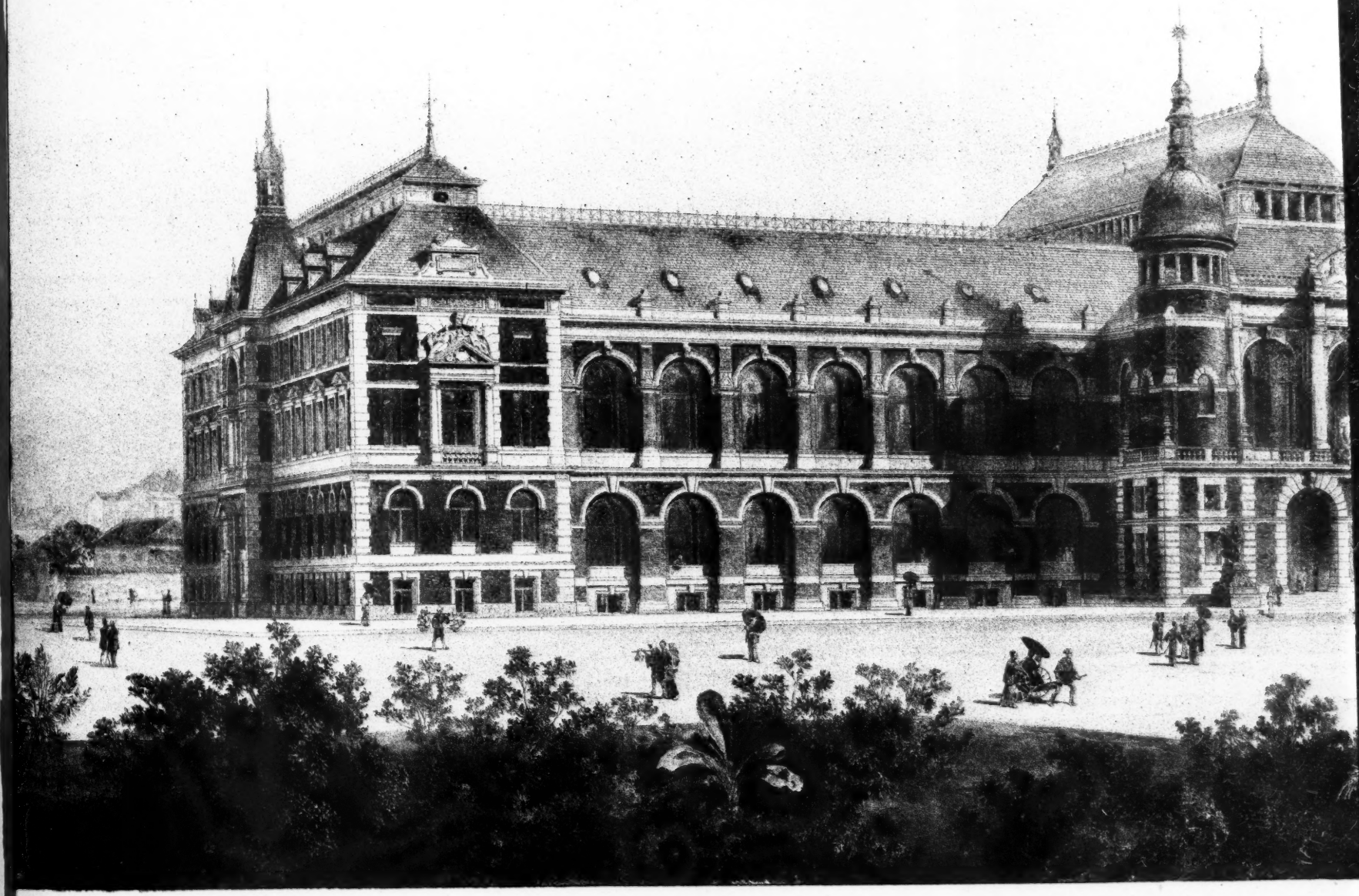
DETAIL OF CENTRAL PORTION.

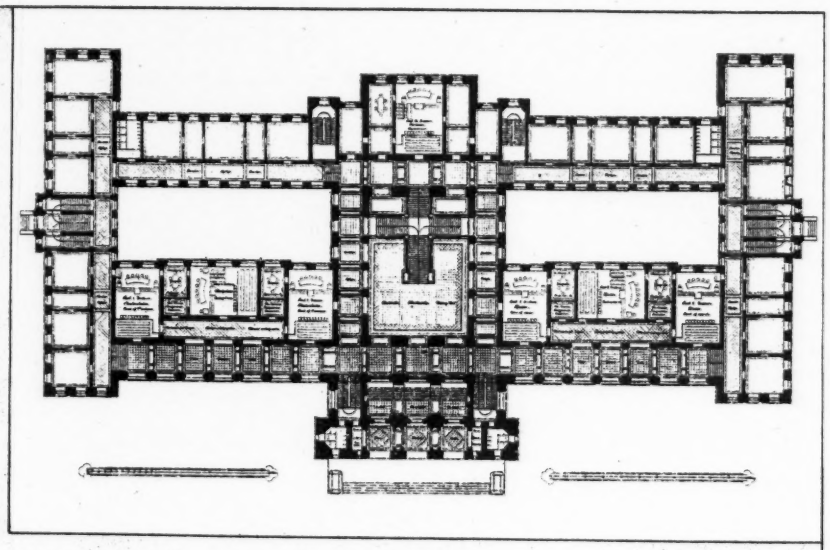
INK-PHOTO SPRAGUE & Co 4 & 5, EAST HARDING STREET FETTER LANE, E.C.

THE NEW IMPERIAL LAW COURTS FOR TOKIO.

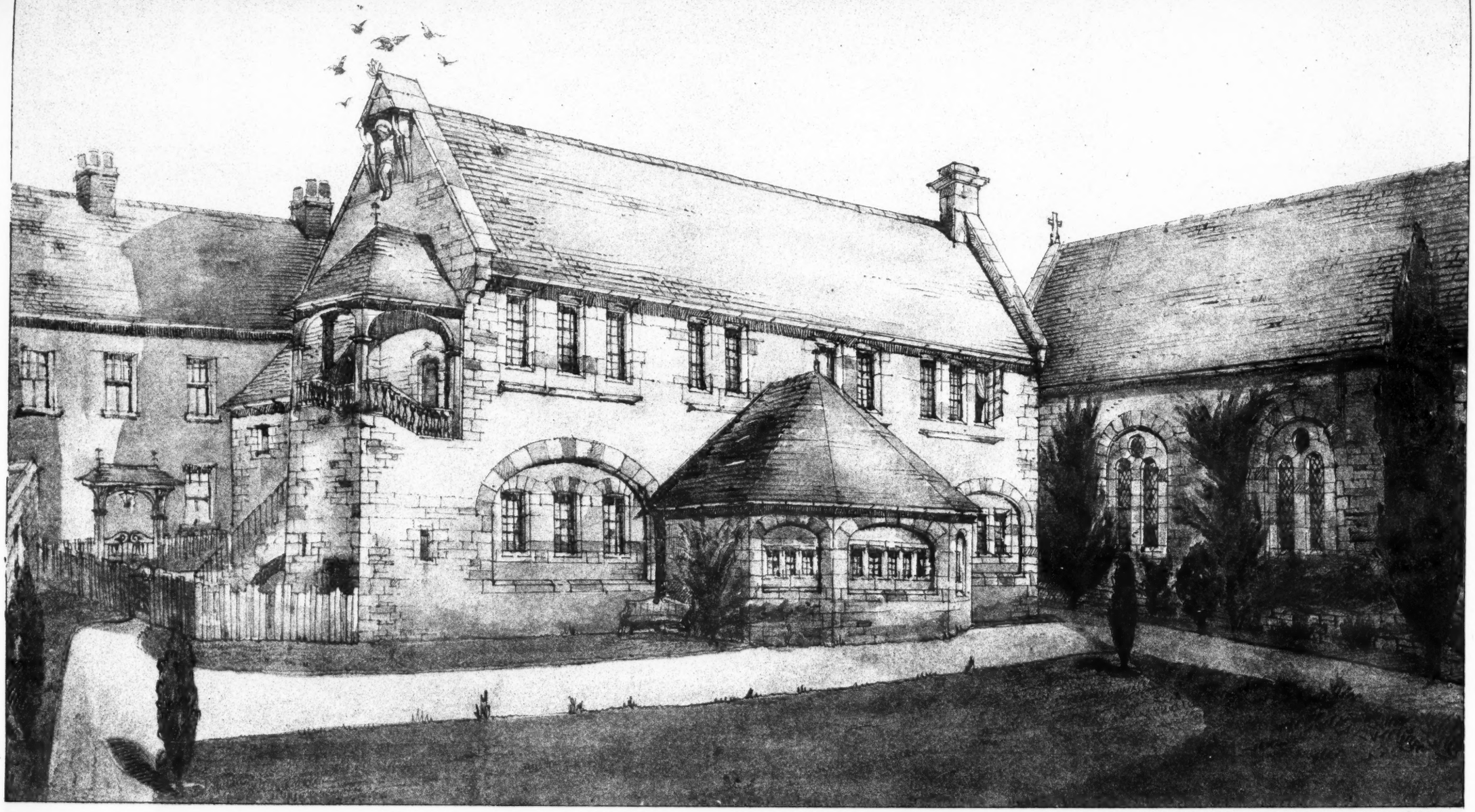
DESIGN AS FINALLY ACCEPTED.

MESSRS. ENDE & BOECKMANN, ARCHITECTS.





INK-PHOTO SPRAGUE & Co 4 & 5 EAST HARDING STREET, FETTER LANE E.C.



INK-PHOTO SPRAGUE & Cº 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

NEW PARISH ROOM AND SCHOOL, ALL SAINTS', PLYMOUTH.—Mr. Edmund Sedding, Architect

Royal Academy Exhibition, 1892.

INK-PHOTO SPRAGUE & Co 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

NEW PARISH ROOM AND SCHOOL, ALL SAINTS', PLYMOUTH.—Mr. Edmund Sedding, Architect

Royal Academy Exhibition, 1892.

INK-PHOTO SPRAGUE & Co 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

ST MARYLEBONE GENERAL DISPENSARY.—Mr. Beresford Pite, Architect.

Royal Academy Exhibition, 1892